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Civil Engineering.

Letters from the United States of North America on Internal Improvements, Steam Navigation, Banking, &c., written by FRANCIS ANTHONY CHEVALIER DE GERSTNER, *during his sojourn in the United States, in* 1839.

(Translated from the German, by L. KLEIN, Civil Engineer.)

(Continued from page 11.)

LETTER VIII.

New Albany, Indiana, June 15, 1839.

Steam Navigation in the United States.

I have given already, in my second letter, a short extract from a printed document, which was laid before Congress by the Secretary of the Treasury, concerning the steamboats, locomotive and stationary steam engines, in the United States. Since that time, I have, in my travels, obtained possession of many and important data about the extent, importance, and perfection of steam navigation in the last year. The following is an extract therefrom.

1. *History and Extent of Steam Navigation.*

Fulton, a North American, the inventor of steam navigation, constructed, in the year 1807, the first steamboat upon the Hudson river, to make regular trips between New York and Albany. The voyage of one hundred and forty-five miles was then performed in thirty-three hours. The success of this enterprize laid the foundation of steam navigation in the United States.

Up to that time the barks upon the Ohio and Mississippi were propelled partly by sails, partly by oars and poles; from Cincinnati to New Orleans (sixteen hundred miles), such a bark came down in five weeks, and went up in eighty to ninety days; for its management nine men were required down, and twenty-four to thirty-two up stream. In March, 1811, the first steamboat built by Fulton, in Pittsburgh, called the "New Orleans," was launched on the Ohio, and commenced in December of the same year, to make regular trips between Natchez and New Orleans. The time required to make the trip of three hundred miles between the two places was three days down stream, and seven to eight days up. The boat performed in a year only thirteen trips up and down, or seven thousand eight hundred miles. A passenger paid eighteen dollars for a passage down, and twenty-five dollars for one up stream.

Fulton constructed several other steamboats in the United States. He afterwards went to Europe, to bring into execution there, his important invention; but he found no encouragement in England, and when he proposed in Paris the introduction of steam navigation, he was derided by the French, and Napoleon declared him an adventurer. The prejudice of the public, in England and all Europe, against an American invention, which, in fact, was only a new application of steam power, was so great, that five years elapsed, before Bell, in 1812, constructed the first steamboat at Glasgow, in Scotland. Steam navigation now came more and more into practice in Europe, but has as yet not attained such an extent there, as in the United States.

On the 6th of May, 1817, the first steamboat, the "Enterprize," went up the Mississippi and Ohio, from New Orleans to Louisville, and arrived there on the 30th of May, or in twenty-five days. As the barks at that time required nearly three months for the same journey, the inhabitants of Louisville were in such an ecstacy, that they conducted the Captain, Shrive, around in triumph, and gave him a public dinner. The steamboats upon the western and south-western waters now, were constantly increasing in number, and in 1834, they counted already two hundred and thirty-four; in the year 1838, their number rose to four hundred. In 1831, there passed through the Louisville and Portland Canal, in the State of Kentucky, four hundred and six steamboats, and four hundred and twenty-one flat boats, with a tonnage together of 76,323; in the year 1837, passed through the same canal, fifteen hundred and one steamboats, and only one hundred and sixty-five flat boats, with a tonnage together of 242,374.

In the year 1818, the first steamboat was launched on the great north-western Lakes; in 1835, they were navigated by twenty-five

steamboats, and in 1838, the number of steamboats was seventy. In year 1834, eighty-eight new steamboats were built in the United States; in 1837, or three years after, one hundred and thirty-four new steamboats were launched. The largest ship-yards for building steamboats, are at New York, Philadelphia, Baltimore; at Louisville, New Albany, Cincinnati, Pittsburgh, and St. Louis.

In total, there were in the summer of 1838, about eight hundred steamboats in operation in the United States; the greatest number, in any one State, belonging to New York, viz. one hundred and forty.

The travel in steamboats along the sea-shore has, as I observed in my former letters, been mostly superseded by rail roads, located in a more or less parallel direction to the sea coast; and will probably, when the whole rail road system is completed, entirely cease; but the steam navigation upon the navigable rivers is getting more into practice, its increase in the last two or three years, has contributed much to diminish the navigation with sailing vessels or barks; not only all kinds of merchandise without exception, but also provisions, as grain, flour, meat, etc., are carried in steamboats as well up as down stream, and while the freightage is almost the same as upon the barks and sailing vessels, the goods arrive much sooner at the place of their destination if carried in steamboats, and are therefore less liable to be damaged. But still more has been done. Upon the Ohio river, stone coals are now brought by steamboats, two hundred and fifty miles, down to Cincinnati, or rather the flat boats, loaded with coal, are taken in tow and brought down the river by steamboats, and the empty barks taken back in the same way, because the cost of transportation is found to be less in this manner. It is true, the extremely high wages of the boatmen and all other labourers, contribute much to this extraordinary result; but as I shall have occasion to show, hereafter, the crew of a steamboat is also very well paid, and it is to be ascribed entirely to the perfection in the construction of vessels and the engines used in them, and in the application of steam, as also to the improved arrangements in the steamboats generally, that they have produced in America the results which have been arrived at neither in England nor in any other part of Europe.

The Americans boast of a system of navigable streams in the southern and south-western States not to be met with in any other country of the globe; they maintain that the length of the Mississippi with the Ohio and all other tributary streams, comprises an extent of one hundred thousand miles of waters navigable by steamboats. I would not answer for the correctness of this number, but the Mississippi alone is navigated by steamboats from New Orleans, under the thirtieth degree, to the Falls of St. Anthony under the forty-fifth degree of

north latitude, a distance not less than two thousand miles, and the number of navigable tributary streams of the Mississippi is indeed so large, that a European, who is accustomed to our short travels by steamboats, can only, by being an eye witness, conceive the magnitude of the system of steam navigation in this country. There are daily, at least four or five steamboats starting from New Orleans for Pittsburgh, in the business season, and as many arrive daily, the distance is two thousand miles, or two thirds of that from England to New York across the Atlantic, and nevertheless the voyage is regarded as nothing extraordinary, and is undertaken after a few hours preparation.

2. *Construction of Steamboats and the Engines used therein.*

The steamboats in America, with the steam engines used on the same, are of three entirely different plans of construction. Those upon the eastern waters, comprising the sea along the coast of Boston to Charleston, S. C., and all rivers emptying into the same, have condensing engines, with large upright cylinders, and long strokes, the larger boats draw from five to seven feet water, and go with a speed of from ten to fifteen miles per hour. Upon the Hudson river, the distance from New York to Albany, of one hundred and forty-five miles, is performed in eleven to twelve hours up stream, and in nine to ten hours down stream, including the stoppages at fifteen or twenty landing places, where passengers come on board or leave the boat. I took a passage in the steamboat "North America," on the 23rd of November, 1838, from New York for Albany; as the river was already nearly half frozen over, a great deal of floating ice was coming down; the boat left New York at five o'clock in the evening, and arrived at Albany the following morning at seven o'clock; we made, therefore, including all stoppages, over ten miles per hour up stream. The length of the vessel is two hundred feet, greatest width twenty-six feet; she has two decks, the lower of which, where the engines are, is about three feet above the level of the water; she has two separate cabins; the gentlemen's cabin, which is, at the same time, the dining room, and the ladies' cabin. We were three hundred and twenty passengers on board, each of whom slept in a berth, and as sufficient room appeared still to remain, one may imagine how colossal this floating palace must be. Two steam engines with fifty-two inch cylinders, move the paddle wheels of twenty-two feet in diameter. The pressure of the steam of this, as of most of the steamboats upon the eastern waters is about fifteen pounds per square inch, and the stroke eight to ten feet; the steam is generally cut off at one third or one-half of the stroke, and operates by expansion. For a

voyage of one hundred and forty-five miles, twenty-five to thirty cords (of one hundred and twenty-eight cubic feet), of soft wood are required. The "North America" draws, when loaded, six feet; but there are passenger boats upon other rivers in the east, which draw, when loaded, only twenty-four to thirty inches of water, and move against strong currents.

The steamboats in the west, or upon the "western waters," are, throughout, very flat, and go, when loaded generally five feet deep, some, however, only thirty to thirty-six inches. When the water in a river is only thirty inches deep, the steamboat contains only the engine and fuel, and the cabins for the men, and flat boats loaded with goods are taken in tow. The passenger boats have two decks, the upper one is for the cabin passengers. The elegant boats contain a large, splendidly furnished and ornamented saloon, used as the dining room, and an adjoining saloon for ladies. The saloons are surrounded by small apartments, (state rooms), each of which contains two berths, and round the state rooms is an open gallery, to which a door opens from each state room. Such a vessel offers to an European an imposing and entirely novel aspect. All steamboats upon the western waters have high pressure engines, the pressure of steam being from sixty to one hundred pounds per square inch. Often two engines are used in a boat, and then each engine propels one of the paddle wheels. The cylinders are horizontal, the stroke is eight to ten feet, and the steam is generally cut off at five-eighths of the stroke, and then operates by expansion. The escaping steam is applied to heat the water pumped from the river, before it gets into the boiler.

The third kind of steamboats is to be found upon the lakes in the north and north-west of the Union, they generally go much deeper than the former, are more strongly built, and are propelled partly by condensing, and partly by high pressure steam engines.

3. *Progress of Steam Navigation since its Introduction in the United States.*

The perfection attained in steam navigation may best be estimated after a comparison of the former and present performances of steamboats, and of the former and present rates of charges for transportation of passengers and merchandise.

In the year 1818, a cabin passenger paid for a passage in a steamboat from New Orleans to Louisville, a distance of one thousand four hundred and fifty miles, one hundred and twenty dollars, and for returning, seventy dollars, the passage up, took twenty days, and down, ten days, at present, cabin passengers pay, in the most elegant steam-

boats, fifty dollars for a passage up, and forty dollars for one down stream; while they go up in six, and down in four days. These charges include boarding, which, considering the abundance and choice of the victuals, &c., ought to be estimated at two dollars per passenger per day. The fare is, therefore, now, for the passage alone, taking the average between a trip up and down, (excluding board,) 2.41 cents per mile. Less elegant boats take cabin passengers up, in eight days, for thirty dollars, and for twenty-five dollars down, in five days, which, after deducting one and a half dollars per day for board, gives only 1.22 per mile, at an average between a trip up and down.

Upon the lower deck of these steamboats, which is a few feet above the surface of the water, are the deck passengers, who provide their own meals, and pay for the same passage of one thousand four hundred and fifty miles, only eight dollars; if they assist the crew in carrying wood upon the boat, they pay only five dollars. In the former case, they pay, therefore, per mile, 0.55 cents.

Merchandize was carried, before the introduction of steam navigation, in sailing vessels, which took a load of one hundred and fifty tons; in the year 1817, the charge for freight per pound, from New Orleans to Louisville, was seven to eight cents; in 1819, the *steamboats* commenced carrying freight, and immediately reduced the charge to four cents per pound. At present, the charges per one hundred weight, from New Orleans to Louisville, are according to the quality of the goods, and the season, at least thirty-three cents, and at the most, one and a half dollars; at an average they may be taken at sixty-two and a half cents for the distance of one thousand four hundred and fifty miles. This makes 0.86 cents per ton per mile.

Between Cincinnati and Louisville, the first steamboat, "General Pike," was put in operation in 1819, and made, weekly, a voyage down to Louisville, one hundred and fifty miles, in eighteen hours, and up again to Cincinnati in forty hours. A cabin passenger paid at that time twelve dollars for a passage. At present, the steamboats have so much increased in number, that at least six boats are daily starting from and arriving at Cincinnati or Louisville. Upon the finest boats, as for instance, the "Pike" and "Franklin," the fare is four dollars, and the time occupied in going up, is, including all stoppages, fifteen hours, and in going down only eleven hours; but these boats have frequently made a passage up in twelve, and a passage down the river in seven and one quarter hours; in the latter case, the speed was therefore over twenty miles per hour. If one dollar be deducted for board, there remain three dollars for the passage, which is at the rate of two cents per mile. The deck passengers who assist

in taking in wood, pay only one dollar or two thirds of a cent per mile, and find their own victuals. For merchandize, the charges are fifteen cents per one hundred weight, or two cents per ton per mile.

From Cincinnati to St. Louis, the voyage is five hundred and thirty-eight miles down the Ohio and one hundred and ninety-two miles up the Mississippi river, making together seven hundred and thirty miles. The passage to St. Louis, or from there back, is performed in four days. A cabin passenger pays twelve dollars, of which we ought to deduct at least four dollars and seventy cents for board, this leaves only one cent per mile for the passage alone. The deck passengers pay four dollars without board, which makes nearly one half cent per mile. Goods pay, at an average, fifty cents per one hundred weight, 1.37 cents per ton per mile.

Upon the Hudson river, the passage fare is, in the most elegant boats, three dollars for the distance of one hundred and forty-five miles between New York and Albany, which gives two cents per passenger per mile; for meals an extra charge is made. In less elegant steamboats, passengers are carried the same distance for one dollar, and at this moment even for fifty cents, which gives only one third of a cent per mile.

From the above data we may infer that, at an average, cabin passengers upon the American rivers pay according to the elegance of the steamboats, from two and a half cents down to one cent per mile (board not included), and deck passengers only about one half cent per mile; both travel, taking the average between up and down stream, with a speed of twelve miles per hour. Goods upon the same steamboats are carried, at an average, for one and one third cents per ton per mile.

These striking results, which are attained nowhere else, are chiefly derived from the improvements constantly made in the construction of the boats and their engines. Of the eight hundred steamboats at present navigating the American waters, hardly two will be found of an entirely similar construction; the steam engines, though subject to the same principles of steam power, differ from the English in nearly all their parts. But, three years ago, eight days were required for a trip from New Orleans to Louisville, which is now regularly performed in six. The most remarkable result is, that a boat of four hundred tons required, twenty years ago, for this voyage of one thousand four hundred and fifty miles, three hundred and sixty cords of wood, while at present, for a six days passage, only the same quantity of wood is required.

4. *Rise of Wages, and of the Prices of all Requisites for Steamboats during the last Year.*

What appears most striking, is, that while the charges for transportation have been constantly *reduced* during twenty years, wages and the prices of all commodities *rose* from year to year. The Captain of a steamboat received twenty years ago, a salary of one thousand dollars per year, now he gets upon the better boats, two thousand dollars. Every steamboat has two pilots, who change every four hours; each of them received, in 1822, only sixty dollars a month, but since that time their salary has risen, and was, in 1833, three hundred dollars, which is still now paid to the pilots of the best boats; there are also two engineers upon each steamboat, their salary was, in 1822, only forty dollars per month, and rose in consequence of the great demand for engineers, to one hundred and one hundred and fifty dollars. The firemen and common labourers received, twenty years ago, only fourteen dollars per month, and get now thirty to forty dollars. The whole crew, besides, have free board upon the steamboats.

The provisions necessary for the nourishment of the passengers upon the steamboats, have risen in price during the last five years, thirty-three per cent.

The steamboats upon the western waters use, almost exclusively, wood as fuel for the engines, which, twenty years ago, was quite valueless; in 1834, it sold on the Ohio and Mississippi, for one and three quarters to two dollars per cord, and costs at present two and one quarter to three and one half dollars; the price has therefore increased in the last five years, about fifty per cent.

5. *Cost of Steamboats.*

The steamboats upon the western waters, whose plan of construction might be adopted to great advantage upon our rivers in Europe, are, as I observed already, principally constructed in Louisville, Cincinnati, and Pittsburgh. Generally, the hull of the vessel is built by ship carpenters, the steam engine delivered from a manufactory, and put on the boat, after which the joiners build the cabins and finish the whole. Three different classes of mechanics are therefore required, with whom separate contracts are made; there are, however, individuals who undertake the building and furnishing of a whole steamboat by contract. As the prices differ much according to the solidity and elegance of the vessels, I herewith state the cost of some of the steamboats, which are among the best.

Between Cincinnati and Louisville, the two steamboats, "Pike" and "Franklin," make regular trips, carrying the United States mail;

one of the two goes daily up, the other down, the river. The "Franklin" is one hundred and eighty-three feet in length at her deck, and the extreme width is twenty-five feet, the depth of hold, or the distance from the keel to lower deck, is six and one half feet. The tonnage two hundred ton. Upon the upper deck are forty-two state rooms, each with two berths, making, in all, eighty-four berths; but matrasses are laid upon the floor of the dining room, when required, and one hundred and fifty cabin passengers may sleep upon the boat. The boat is propelled by two engines, the pressure of steam is eighty pounds per square inch, the diameter of the cylinders, which are in a horizontal position, is twenty-five and one half inches, the stroke seven feet. The steam is cut off at five-eighths of the stroke, and acts through the remaining three-eighths by expansion. The diameter of the paddle wheels is twenty-two feet, their width eleven feet, the dip is twenty-two inches, the paddle wheels generally make twenty-eight revolutions in a minute. The length of the connecting rod is twenty-three feet. There are six boilers of wrought iron on board the boat, each twenty-three feet in length and sixty inches in diameter, each boiler has two flues of fifteen inches diameter.

At an average, the steamboat carries one hundred and twenty-five passengers, one half in the cabins, and the other half on deck, and besides twenty-five tons of goods. With this load she draws six feet water. The boat was constructed in the year 1836, and the cost was:

For the hull, at twenty-five dollars per ton, -	$5,000
" two steam engines, - - -	12,000
" joiners work for cabins, - -	4,000
" draperies, mirrors, bedding, and other furniture in the state rooms, saloons, and kitchen,	9,000
Total, - -	$30,000

This boat is, as observed, one of the most solid and elegant; other steamboats of the same dimensions have cost five thousand to six thousand dollars less.

Amongst the steamboats of the largest class, which run only between New Orleans and Louisville, the "Sultana" and the "Ambassador," are now much favoured by the public; the "Ambassador" has two hundred and fifteen feet length of deck, and thirty-five feet extreme breadth. Her tonnage is four hundred and fifty. On the upper deck are forty-four state rooms, each with two berths, but as many beds may be arranged upon the floors of the saloons. Of the two steam engines, each has a horizontal cylinder of twenty-five inches diameter and eight feet stroke; the steam acts with a pressure of ninety pounds per square inch, and is cut off at five-eighths of the

stroke. The diameter of the paddle wheels is twenty-two feet, their width twelve feet. The boat generally carries two hundred tons of goods up, and three hundred tons down stream, besides one hundred cabin and one hundred and fifty deck passengers; she draws, empty, five feet, and when loaded, seven feet water. The hull of this boat has cost twelve thousand dollars, the engines seventeen thousand, the joiners work, and the whole inner arrangement of this highly elegant structure, amounted to thirty-one thousand dollars, making the cost of the whole boat sixty thousand dollars. It must, however, be observed that great and costly alterations were made during the construction, so that her cost would actually not exceed fifty-five thousand dollars.

Well instructed individuals, who are very much interested in the subject of steam navigation, estimate the average cost of a steamboat upon the eastern waters, at forty-five thousand to fifty thousand dollars, upon the western waters, after a special calculation, at twenty-three thousand five hundred dollars, and upon the lakes, the average between the two, or at thirty-five thousand dollars. Consequently all the steamboats, which were in operation in 1838, have cost as follows, viz.

351	boats upon the	eastern	waters, at	$47,500	$16,672,500
385	" "	western	"	23,500	9,047,500
64	" "	lakes,	"	35,000	2,240,000
800	steamboats, each at an average cost of			$34,950	27,960,000

Now, as since the introduction of steam navigation, thirteen hundred steamboats were built in the United States; the whole capital invested by the Americans in steamboats, amounts to forty-five millions four hundred and thirty-five thousand dollars, the greater portion of which has been expended in the last five years.

To be continued.

Notes of an Experiment with Locomotive Engines. By George W. Whistler, Esq., Civ. Eng. W. R. R.

It is the custom to speak and write of Locomotive Engines in reference to their *power* almost exclusively; hence we frequently see in the public prints notice of the performances of engines where the extraordinary results (if they be extraordinary) are set forth to show the superior power of the engine, and accompanied too with remarks calculated, if not intended, to lead the reader to believe that the builder, by some invention or peculiar mode of construction of his own, had

succeeded in producing a greater effect from the same cause than had heretofore been accomplished.

That one engine may be of superior power to another of course is true; just as true as that one house may be of greater capacity than another and for the same reason; because it is built to order on a large plan; but it must be equally true than an engine can have no greater power than is *due to the capacity of its boiler to generate steam*, and that the effect produced by this power can be no greater than is *due to the available weight of the engine for adhesion.* Yet it is sometimes stated that the engines of one maker with less available weight (weight on the driving wheels) than those of any other maker, have superior power and will draw much heavier loads.

To those at all acquainted with the present state of the locomotive engines, and the mode of construction pursued by almost all makers, both in this country and in Europe, to whom the causes for effect are obviously of so definite a nature, and so perfectly limited in every case —being subject to order—such statements and assertions seem strange and unaccountable; it is in fact to say that one pound used as a power will produce a greater effect than another pound, or more distinctly, that the gravity of one pound is greater than the gravity of another pound; and it must be attributed to the apparent inutility of contradicting such absurdities that these statement have been permitted to pass unnoticed. But since it is so apparent that few, if any, will take the trouble to investigate and understand the causes and effects in this machine, but rather treat all questions relating to it as matters of veracity, apparently regardless of the absence of all probability or even possibility of such effects from such causes, I am induced to offer the result of a recent trial on this road of two engines of different makers to ascertain their relative *effective* power.

I am the more induced to do this, because I conceive the growing faith in these oft repeated and undenied statements of superior and *peculiar* power, is not only injurious to the builders themselves, but to the true interests of rail road companies.

It is of serious injury to rail road companies because it induces them, in the expectation of rapid improvements, to limit themselves too closely in their first outfit, and then in the expectation of procuring something of superior and peculiar power, they are induced to go from maker to maker as each may set forth such claims; thus collecting a variety of pattern destructive of that uniformity in the several parts of the engine, which by affording the facility of shifting parts from one to another, or applying parts common to all, is so essential to the economy and despatch of the operations of the road. This variety of pattern and make on any road creates an equal variety of opinion

and prejudice among the agents of the road, for and against engines of different makers, equally prejudical to the maker and the company; when in fact there may not, and among makers of reputation (so far as power is concerned) there is not any other difference than may be the result of the architectural fancy of the builder, sufficient, however, to destroy all uniformity; and I am fully of opinion that this uniformity is of such importance, that all deviations should be avoided until the advantages of a change are of such an obvious nature as to render a total change desirable.

I presume the advantages of this uniformity in the parts of engines cannot be doubted. I have no hesitation in saying (and my experience leads me to it) that a given number of engines with perfect uniformity of parts, permitting the immediate shifting of parts from one to another will perform more, much more, work than the same number equally good in themselves but all differing from each other, and that there are great advantages too in having all the engines on one road of the same make I think will be admitted, when, wherever this is found to be the case on any road, there you find the engines in the best order, and enjoying the best reputation; and whether this be the effect of the prejudices of those who use them, or their faith and natural pride in the good qualities of *their engines* where all are alike, instead of the variety of opinion and equally natural prejudice in favour or against engines of particular makers where all are different; the public is there less incommoded and the company less prejudiced by the delays consequent upon accidents to, or defects in the engines.

Another injurious effect upon rail road companies, and likely to be more serious in its consequences is, that this faith in the superior and *peculiar* power of engines, leads to expectations of almost unlimited effects; at least to such extent that almost any grade could be ascended without the least inconvenience: in short, expectations that could never be realized without some special dispensation of the law of gravity; yet in conformity with these expectations it is frequently urged that roads should be constructed (with reference to cheapness) to conform nearly to the natural surface of the ground, regardless of steep grades, since engines had been *invented*, or certainly soon would be, with power to ascend the steepest as easily as they had heretofore on a level—and engineers are not unfrequently placed in the embarrassing predicament to be overwhelmed with *facts and statements!* in relation to the superior and mysterious effects of engines, depriving them of the immutability of nature's law of gravity to found an argument on.

The Locomotive is a steam engine of the most simple form, and the general plan of construction pursued by almost all makers is essen-

tially (so far as power is concerned) the same. The boilers, the source of power in all, are similar,* being cylindrical, horizontal and tubular; the only difference being that some have square or rectangular furnaces, and others have circular or rounded furnaces; each, however, being able to generate steam sufficient to overcome the adhesion due to the weight of the engine; indeed, this is understood by all good makers to be a necessary condition, and all that I am acquainted with accomplish it.

The reciprocating motion of the piston is applied directly by means of slides and a connecting rod to produce a circular motion of the wheels, either by a crank in the wheel axle, or (which is the same) to a pin in the spoke of the wheel; the effect is precisely the same in both, and if the adhesion between the wheel and the rail be greater than the resistance to progressive motion of the engine and train (from friction and gravity) then will the whole advance; but if it be not, and there be steam power sufficient to overcome what adhesion there may be (and all engines have this power) then will the engine and train remain stationary, while the wheels turn round, slipping, on the rails; and no additional application of steam power can cause it to advance; to say otherwise would be so say, that if I *(having strength sufficient)* should break a lever in attempting to lift a weight, another, *because he has greater strength*, could lift the weight with the same lever!

Yet this is what the public are made in a great measure to believe by the statements we so frequently see of the extraordinary performances of engines. It must be clear then, that the limit to the power of any locomotive engine to propel trains *is the adhesion of its driving wheels to the rails*, which adhesion is at all times, and under all circumstances, *in proportion to the weight on the driving wheels;* and although this adhesion is not the same (in amount) under all circumstances, varying as it is well known, with the condition of the rails, as effected by the state of the weather, &c.; yet it is *always the same with all engines under the same circumstances;* hence the relative effective power of any two engines—power to propel trains—must be strictly *in proportion to the whole weight on the respective driving wheels of each;* which will be seen to correspond with the result of the trial.

I give you the statement as made at the time, officially, to the President of the Corporation, for the information of the Board of Directors.

* This is not strictly correct, vertical tubular boilers are used on engines in Maryland to a considerable extent, and various forms have been adopted in England for the boilers of locomotives on both common and rail roads. Com. Pub.

ENGINEERS' OFFICE, WESTERN RAIL ROAD,
Springfield, August 24th, 1840.

THOMAS B. WALES, ESQ., President W. R. R. Corporation.

Dear Sir,—In accordance with the leave granted to Mr. Richard Imly, by vote of the Board of Directors of the 11th of April last, to place an engine on this road for trial, he arrived at our depot here on Thursday afternoon with a locomotive engine, constructed by Mr. William Norris, of Philadelphia; the engine is of the largest class: on eight wheels, four being drivers of four feet diameter; her cylinders are twelve and a half inches diameter, and length of stroke twenty inches.

It was arranged that the trial should be made next morning with this engine, to ascertain what load she could draw up the plane on this road, next to our depot here; (it being the maximum grade east of the Connecticut river) and also to see if one of the corporation engines could draw up the same plane an equal load in proportion to the weight on its drivers.

The foot of this plane intersects the level through the depot yard about two hundred feet from the passenger house, and rising at the rate of 60 feet per mile for 8,200 feet, then at the rate of 66 feet per mile for 2000 feet, then at the rate of 46 feet per mile for 700 feet, and thence to the top at the rate of 60 feet per mile, is two and forty-four hundredths miles in length.

The engines being ready with full tenders of wood and water, and steam up, were brought to the platform scales to be weighed; the object being not only to ascertain the whole weight of each engine, but what portion of the whole weight is brought to bear on the driving wheels of each; it is known too, that when the steam is applied to give motion to the engine the effect is to alter the distribution of the weight of the engine between the forward and driving wheels, relieving the former of a portion of their weight and placing it on the latter. Measures were taken in the weighing to ascertain the extent of this change; this was done by placing each engine, first with the forward wheels on the platform scales; the tender, being attached to the engine, was chained to the track to prevent the advance of the engine when the steam was let upon the piston, that the effect might be exhibited by the scales; this effect was to relieve the forward wheels of a part of their weight.

The driving wheels were next placed on the platform, the tender chained to the track as before, and the steam applied; the effect was to increase the weight on the driving wheels.

The results of the weighing are as follows:—

Engine "America," built by Norris.

Weight on driving wheels, - - -	17,550 lbs.
Do. forward wheels, - - -	11,590
Total weight of engine -	29,140 lbs.

Weight of Tender, (eight wheeled) wood and water.

Weight on forward truck, - - -	13,050 lbs.
Do. hind truck, - - - -	12,870
Total weight of tender -	25,920 lbs.

Weighing under Pressure of Steam.

Weight on forward wheels without steam,	11,590 lbs.
Do. do. do. with steam, -	9,650
Difference - - -	1,940
Weight on driving wheels without steam,	18,620
Do. do. do. with steam, -	20,010
Difference - - -	1,390

After this engine had performed her trip, she was placed again on the platform scales, it having been observed that she worked under higher pressure of steam up the plane than when on the platform at the first weighing; at this weighing the result was as follows:—

Weight on the driving wheels without steam,	19,220 lbs.
Do. do. do. do. with steam,	21,070
Difference - - -	1,850

It will be seen that these several weighings differ in their results; this may be attributed, in part, (in the cases where the weights of the same parts of the engine differ when weighed *without* the action of steam) to a different state of the water in the boiler, and to the fact that at the first weighing of the driving wheels the engineer and fireman were both off the foot board; but I am inclined to believe from the very great difference between the first and last weighing, which last was made with great care, that there must have been some error in reading off the first weight.

The difference in the weights under the pressure of steam may be attributed to the different positions of the cranks at the time of weighing, since the effect would vary from a maximum to nothing, depending upon their position.

Taking the weights, however, as they were recorded.

The first weight of the drivers without steam, was	17,550 lbs.
Add weight taken from forward wheels by first weighing with steam, - - - - - - -	1,940
Total weight on drivers in operation by first weighing	19,490
Second Weighing.—On drivers with steam, -	20,010
Third Weighing.—On drivers with steam, -	21,070
	3)60,570
Mean weight on drivers in operation,	20,190

Engine "Suffolk," built at Lowell.

Weight on drivers, - - - - - - -	16,150 lbs.
Do. on forward wheels, - - - - -	7,480
Total weight of engine - - -	23,630
Tender (four wheeled) wood and water - -	14,000

Weighing under Pressure of Steam.

Weight on drivers without steam, - - -	16,075 lbs.
Do. do. with steam, - - - -	17,150
Difference, - - - - -	1,075
Weight on forward wheels without steam, - -	7,480
Do. do. do. with steam, - -	5,700
Difference, - - - - -	1,780

First Weighing.

Weight on drivers without steam, - - -	16,150 lbs.
And weight taken from forward wheels, - -	1,780
Total weight on drivers in operation, first weighing,	17,930

Second Weighing.

Weight on drivers with steam, - - - -	17,150
	2)35,080
Mean weight on drivers in operation, - - -	17,540

The effective weight (weight on the drivers) of the "America," Norris' engine, is - - - -	20,190 lbs.
That of the "Suffolk," Lowell, is - - - -	17,540

Immediately after the weighing was completed, the "America" was attached to a train, consisting of twenty-seven cars, and started on the level at the foot of the plane within about 400 feet of the plane, commenced ascending with a velocity of about seven miles per hour; ascended about one mile, gradually diminishing the velocity until the adhesion of the drivers being overcome, the wheels slipped and the train stopped, not being able to proceed further up the plane with the load; returned with the train down the plane to the starting station. Mr. Imly was requested to take such load as he thought the engine would take up the plane at a speed not less than six miles per hour; he detached six cars; started again with twenty-one cars, gross weight 259,698 lbs.; with this load she ascended the plane, with steadiness to the top in twenty-six minutes, being at the rate of 5.63 miles per hour.

The engine returned again, with this load, to the starting place, when the "Suffolk" (Lowell) was attached to the same train, leaving off four cars, taking seventeen cars, gross weight 198,042 lbs.; with this load she ascended the plane to the top in 14¾ minutes, being at the rate of 9.92 miles per hour.

It was supposed when this trial was made that the train would give a load to this engine equal to that taken by the "America," in proportion to their effective weights; but it was found, after weighing the cars, that the load was deficient.

The "Suffolk" was again attached to the train with nineteen cars; gross weight 234,218 lbs.; with this load she ascended the plane to its top in 21½ minutes, being at the rate of 6.8 miles per hour.

The whole load of the "America's" train, Tender included, was

Tender	- - - -	25,920 lbs.
21 cars	- - - -	259,698
Total	- -	285,618

That of the "Suffolk's" train, Tender included, was

Tender	- - - -	14,000
19 cars	- - - -	234,218
Total	- -	248,218

Effective weight of the "America,"	20,190
Do. do. do. "Suffolk,"	17,540

Then $\frac{17{,}540 \times 285{,}618}{2{,}190} = 248{,}129$ lbs., the load the "Suffolk" should have taken; she did take 248,218 lbs., thus showing that the effect produced by each engine, except in speed, was as it should be, *equal.*

The greater speed of the "Suffolk" is most probably due to the greater diameter of her driving wheels; as the velocity of both trains was such—being small—the difference between them may not have materially effected the resistance.

The engine "Suffolk" is on four wheels, two of which are drivers, four and a half feet diameter. Cylinder twelve inches in diameter and eighteen inches stroke. Pressure of steam in the boiler, ninety pounds. Pressure of steam in the boiler of the "America," one hundred and thirty pounds.

Architecture.

Street Architecture.

Although the means afforded in this description of building for producing architectural effect are greatly circumscribed by the want of room and distant views, yet there are other considerations connected with it which render the subject one of decided importance:—the beautiful suburban villa—the rural and romantic cottage, may, indeed, ennoble and delight the mind of the spectator far more than the most perfect specimen of street architecture; but where *one* sees the villa or the cottage, a *thousand* see the city building; and a thousand minds are in some degree humanized and elevated, however, unconsciously, by its beauties.

Various plans have been resorted to in European cities to improve street architecture by legislative enactments, but with little success. Petersburgh, for example, is all built from designs submitted to, and approved by the government, with the exception of a single street; and that, in 1813, was the only one in the city, (as we are told by Mr. Louden) in which there are varied elevations, and, as the consequence, the only lively and agreeable portion of the town; the rest being a tiresome repetition of similar forms.

The new part of Edinburgh is built on a still more restricted plan —all the street elevations are furnished by one architect, and no builder is permitted to depart a fraction from the prescribed plan without the special sanction of the court; "hence (says the excellent writer just quoted) "it is one of the tamest congregations of buildings in Europe, and were it not for the external views of the old town on one side, and the Frith of Forth on the other, the new town of Edinburgh would be as dull as Berlin." This monotony is, however, counterbalanced by the magnificence of the surrounding scenery, the beautiful situation and grouping of the city, its cleanliness, and the substantial character of its

architecture,—a combination of qualities which render Edinburgh one of the loveliest and most romantic spots in the world.

Other European cities have similar, though modified restrictions on their street architecture, but seldom with a desirable effect;—the perfection of this description of building would be, not to have two elevations alike in any one street; as a repetition of similar forms, beyond what may be required for symmetry, always results in a fatiguing monotony.

The grouping of several houses so as to present the appearance of one extensive establishment, has, when tastefully designed, a better effect than almost any other description of city architecture, and it is certainly to be regretted that so few attempts have yet been made to embellish our streets by adopting a method at once so simple, economical, and effective. This plan has been successfully pursued in European cities to a considerable extent; in London especially it presents some of the most attractive specimens of city architecture ever executed.

An expression of unity may thus be imparted to a row of houses without interfering at all with the idea of their being separate dwellings; all that is required is to advance and elevate the centre and corner houses beyond and above the rest, and to proportion the various parts to the magnitude and importance of the entire group. Such a composition, no matter how poor and plain its individual features may be, will always awaken agreeable emotions of taste;—it looks like a finished work; the spectator realizes that nothing can be added to, nor taken from it, without destroying its oneness; and even though it may be wanting in the higher graces of art, it possesses qualities on which the mind may dwell with pleasure.

T. U. W.

Franklin Institute.

Annual Meeting.

The annual meeting of the Institute was held at their Hall, January 21st, 1841. Thomas Fletcher, Vice President, in the chair; George W. Smith, Recording Secretary, P. T.

The minutes of the last meeting were read and approved.

Donations were received from The Zoological Society of London; The Society of Arts at London; The Royal Geographical Society of London; Professor M. Faraday, London; Petty Vaughan, Esq., London; Messrs. Marsh, Capen, Lyon, and Webb, of Boston; Thomas Bakewell, of Pittsburgh; Ohio Mechanics' Institute, Cincinnati; Geo.

Merrick, Esq., New Orleans; William A. Burt, Mount Vernon, Michigan; John Stewart, Esq., of Tennessee; James Herron, of Maryland; C. A. Woolsay, President of the Midlothian Coal Company, Virginia; Messrs. Frederick Fraley; M. W. Baldwin, Henry S. Tanner, J. Lyons, John H. Cresson, John Gest, Edwin Bishop, Alfred C. Jones, Isaac Hays, M. D., G. Emerson, M. D.; The American Philosophical Society; The Lehigh Navigation Company; The Legislature of the State of Pennsylvania; Professors Henry D. Rogers, and John F. Frazer, of Philadelphia.

The Actuary laid on the tables the periodicals received in exchange for the Journal.

The annual report of the Board of Managers, accompanied by the reports of the Treasurer and the several Committees, were read, accepted, and referred to the Committee on Publications.

On motion it was

Resolved, That the report of the Board of Managers be referred to a Select Committee of fifteen, who shall, in conjunction with the Committee of the Board, consult and report which measure should be taken to advance the interests of the Institute, and report at a special meeting, to be called by them.

The following gentlemen were named as the Committee.

Joseph Warner,	William B. Fling,
David S. Brown,	Richard Price,
Robert Peirsal,	Thomas Scattergood,
Paul W. Newhall,	Townsend Sharpless,
George M. Justice,	Samuel R. Brick,
John K. Kane,	Thomas S. Stewart,
John P. Wetherill,	Findley Highlands,

Thomas U. Walter.

Mr. Findley Highlands, from the Committee of Tellers of the annual election for officers and managers of the Institute for the ensuing year, (appointed at the preparatory meeting, this day), presented their report of the result of the election; when the Vice President declared the following gentlemen duly elected.

James Ronaldson, President.
Isaiah Lukens, } Vice Presidents.
Thomas Fletcher, }
Isaac B. Garrigues, Recording Secretary.
Alexander Dallas Bache, Corres. Secretary.
Frederick Fraley, Treasurer.

MANAGERS.

Samuel V. Merrick,	Charles B. Trego,
Abraham Miller,	Henry Troth,
John Struthers,	John S. Warner,
Matthias W. Baldwin,	William Hart Carr,
Isaac Hays,	Henry D. Rogers,
J. Henry Bulkley,	John Gilder,
John Agnew,	Ambrose W. Thompson,
John Wiegand,	George Taber,
Samuel Hufty,	Thomas U. Walter,
John C. Cresson,	John H. Towne,
Andrew M. Eastwick,	James Hutchinson,
Isaac P. Morris,	Edwin Greble.

Extract from the minutes.

THOMAS FLETCHER, Vice President.

GEORGE W. SMITH, Recording Secretary, P. T.

Seventeenth Annual Report of the Board of Managers of the Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts.

The managers of the Franklin Institute present their seventeenth annual report. The year which has just closed has been marked with an unusual degree of activity by our Society, in all the departments of science and the useful arts, to which the attention of the institution is directed by the charter. The particular details of the labours of the several committees of the board of managers, and of the exertions of the professors, have been presented to the Institute in the usual quarterly reports. It may not, however, be uninteresting to the members to make, at this time, a brief summary of the transactions of the year, nor will it, we trust, prove unprofitable to the institution, if we thereby ascertain what is still needed to enable us fully to realize the plans of our original establishment. The great department of the Institute is that of instruction; to the ends of this one all others are subservient, and our usefulness must, in a great degree, be advanced or restricted by the attention to, and success of, our various courses of teaching. So far as the labours of devoted and able instructors will fortify us in this respect, and so far as various and interesting knowledge presented to the classes may have a tendency to promote our success, we may congratulate ourselves in possessing them all. The series of lectures for this winter, embrace complete courses on general chemistry, natural philosophy, and mechanics, application of chemistry to arts and manufactures, geology

and architecture, and in addition to which, we have already had one volunteer lecture on architecture, by a distinguished architect of Baltimore, Robert Cary Long, Esq., in whom the Institute recognize a zealous as well as a highly gifted friend; other gentlemen of ability have likewise promised to lecture on various subjects of interest and utility, by which five evenings in each week will be occupied in our lecture room. It has already been announced that in consequence of the much regretted resignation of Professor John K. Mitchell, a vacancy occurred in our chair of general chemistry, which had been filled by the election of John F. Frazer, Esq. While the distinguished ability of Professor Mitchell made it a difficult task for the Board to select a successor who could advantageously fill the chair which he had vacated, the Board feels that in the talents, zeal, and energy of Professor Frazer, they have met with a gentleman every way worthy to succeed Professor Mitchell, and the general approving voice of the large class of the present session fully confirms the propriety of his selection for the chair. In addition to the regular duties of the chemical chair, Professor Frazer is furnishing the Institute with a full course of lectures on geology, a subject which, in its intimate connections with many important departments of human industry, enjoys, at the present time, a large share of public attention. Professors Cresson and Booth continue in their respective chairs of natural philosophy and mechanics, and of chemistry applied to arts and manufactures, and in the new and valuable illustrations which they are daily presenting to the members, of the discoveries in science, which tend to facilitate various processes in the arts, and to disseminate more correct knowledge of the principles upon which the arts depend. The Institute is steadily progressing under their instructions in forming a body of well trained practical men, fully competent to undertake the construction of the most ponderous machines, or to introduce into our manufactories and work shops, the latest improvements. A course on theoretical and practical architecture has been authorized by the Committee on Instruction, and Thomas U. Walter, Esq. elected to the Professorship in that department. Mr. Walter has just closed his series of lectures for the present season, and the Board feel that in bringing a mind like his, clothed with all the knowledge and experience which places the resources of that art, both ancient and modern, tributary to the illustration of his subject, they have not only contributed to the advancement of the class in a proper appreciation of the beautiful in building, but likewise connected that knowledge with the expressive and high wrought poetry with which the grand but crumbling monuments of skill have been commemorated. The drawing school continues under the charge of Mr. William Mason, assisted

by Mr. S. Rufus Mason, and there are sixty-three pupils in attendance. These pupils have the privilege of attending the lectures of the Institute, and in addition to them, two hundred and sixty-two minors' tickets have been issued, forming a class of three hundred and twenty-five, who are receiving the benefits of our extended courses, at the extremely low price of one cent per lecture. The number of ladies' tickets issued this year have been only sixty-one, which is a subject of regret to the Board, as the influence of their presence and example in the class room cannot but be of great advantage in promoting order and attention.

The very interesting exhibition of American manufactures, held by the Institute in October last, and of which a detailed report has been published, and extensively circulated, fully sustained the character of our country for ability to produce all that has been found necessary for our comfort and ornament. The medals and certificates then awarded have been nearly all delivered, and the value which our manufacturers set upon these tokens of the approbation of our institution, is the best evidence we can furnish of its universally acknowledged usefulness. The suite of rooms in the third story of the hall has been fitted up for the reception of the cabinets of models and of specimens of arts and manufactures, and the access to these collections made easy by a flight of stairs leading from the reading room. Our collection of models, placed under such favourable circumstances, and superintended by a zealous and faithful Committee, is rapidly increasing, and will soon fill the space allotted to it. The cases for the reception of the collection in arts and manufactures, are all prepared, and some valuable specimens have already been deposited. Almost every member of the Institute can readily contribute something from his own work-shop, manufactory, or store, to enlarge the deposits already made, and when the interest and value which such a collection must have in the minds of those who are participating in the benefits of the institution, are taken into view, we feel assured that the donations of our brethren will be liberal. The cabinet of minerals has been regularly arranged by the efficient Committee in charge of it, and already contains a great number of rare and valuable specimens. These are daily augmenting by the donations of our friends in all quarters of the country, and our collection is much frequented by the members, who are gradually acquiring a taste for the beautiful sciences of geology and mineralogy.

The library is receiving gradual additions; it now contains about two thousand five hundred and twenty-two volumes, and during the year, one hundred and fifty-eight volumes have been added, by donations, exchanges for the Journal, and purchase. It has been mat-

ter of regret to the Board that the limited funds of the institution will not permit more liberal appropriations for the purchase of books. The attempt, on the part of the Institute, to establish a Mechanics' Exchange, with fixed hours for the assembling of the mechanics and manufacturers, for the transaction of their regular business, has failed; but it is believed that many of the advantages anticipated from it are realized, in informal meetings which occur throughout the day and evening, in the reading room. The meetings held monthly for conversation on scientific and mechanical subjects, are continued on the same plan as those held last winter, and they continue to be well attended.

Although the Journal of the Institute has met with a considerable share of patronage, the Committee in charge of its publication have found that it was barely defraying the expenses of its editorship and printing. Anxious, however, to secure such a periodical to our country, they have recently made arrangements with several gentlemen of distinguished ability, to furnish contributions regularly for its pages. The talent thus enlisted in its support, and the determination of the Committee to publish it in a larger type, and make it more generally interesting, will, it is hoped, be met by the members of the Institute and the public, by a liberal support of the work. The number of subscribers from among the members of the Institute is quite too small, and it should be a matter of pride with them to place the periodical of their own institution on a ground at least as favourable for its continued publication as seems to be afforded to works of a similar character, coming from the press of our neighbouring cities. The labours of the Committee on Science and Arts, have, as heretofore, been very great. Fifty-nine new inventions, or claims to such, have been presented for their examination, and upon those entitled to favour, as either containing new adaptations of principles or new and valuable combinations, the Scott's legacy medal and premium, or favourable reports have been awarded. During the year, the medal and premium above alluded to, have been deemed due to ten inventors or to ingenious men for improvements, and after making the necessary proofs of originality, they have been awarded and delivered. Under new arrangements made by the Committee on Meteorology, the number of observations on atmospheric phenomena have been increasing.

At present, reports are now received regularly from thirty counties in this State, and also from highly respectable and zealous observers in other States. Regular tables of the mean state of the observations made in our own Commonwealth, are published monthly in the Jour-

nal, and form valuable tables for comparison with those made and recorded elsewhere.

Within the year, the following gentlemen have become Life Members of the Institute.

Messrs. Thomas Mellor, James Christy, Thomas Firth, Isaac S. Ashton, Michael Magee, William H. Moore, Henry J. Biddle, William J. A. Birkey, Owen Jones, William C. Betts, Joseph Woods, Joseph W. Busby, George W. Toland, John Agnew, Lewis Taws, Levi Morris, G. D. Rosengarten, Andrew Young, Thomas D. Lee, William M. Hartshorne, Joseph Hartshorne, M. D., and three hundred and sixty-two new members have been elected.

As nearly as can be ascertained, about fifteen deaths have occurred, and sixty-four have resigned; the actual number of members, both life and annually contributing, may be set down at two thousand. For the state of the funds of the institution, as connected with its general expenditures, publication of the Journal, sinking fund and loans for the hall, and the purchase of the Masonic Hall property, the Board refer to the accompanying reports and statements, from the Treasurer and Committees.

JOHN C. CRESSON, *Chairman.*

WILLIAM HAMILTON, *Actuary.*

Philadelphia, January 20th, 1841.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on WM. A. BURT'S *Solar Compass.*

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination a Solar Compass, invented by WM. A. BURT, of Mount Vernon, Michigan: REPORT,

That they have examined the instrument of Mr. Burt, which is a modification of that for which he received the Scott's Medal in 1835. The instrument in its principal parts has been already described. The improvements introduced by its inventor tend to render the instrument more simple in its use, and more permanent in its adjustments. The method is susceptible of any degree of accuracy desired. In the model submitted to the committee, which was the workmanship of Mr. Wm. J. Young, the principle of reversion is applied throughout, and serves to remove all danger of index error in any of its adjustments. In a clear day, in a latitude not yet determined, this instrument, without the use of a telescope, is adequate to the determination of latitude within two minutes, and differences of latitude perhaps to one minute. The line of sight being brought in the direction of an object, and the instrument adjusted for the sun's actual declination,

and the latitude of the place, (determined by a previous culmination of the sun with this instrument,) the exact azimuth from the true north or south is read, and the reading of the compass is of no further use than to serve as a check to the comparative azimuths determined astronomically, and also to furnish a permanent record of the variation of the compass for the particular station. The instrument is simple in its construction and use—requires, when properly understood, no inconvenient expenditure of time—and in districts abounding in magnetic iron ore, is almost indispensable. It seems to be a very important improvement over the ordinary surveyor's compass, and deserving of great commendation. Above all, the committee cannot omit to mention the exceeding value of surveys made with this instrument, in fixing the variation of the compass, and thus furnishing besides the particular result, viz. the boundary and contents of the field or plot, the permanent record also of the magnetic variation. When such results are increased, and the instrument more generally used, which its intrinsic merit fully warrants, a most important addition will be made to the stock of our knowledge on this highly useful element, viz., the magnetic declination and its periodical changes in a great variety of localities.

By order of the Committee.

WILLIAM HAMILTON, *Actuary.*

Philadelphia, Dec. 14, 1840.

Mechanics' Register.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1839.

With Remarks and Exemplifications by the Editor.

1. For an improved *Frame Work Knitting Machine;* Richard Walker, Portsmouth, New Hampshire, December 5.

Those who have ever seen a stocking frame must be aware of its great complexity, or rather of the great number of pieces which go to make up the instrument. In the present instance an attempt is made, and we think not without success, to give to the machine greater simplicity without sacrificing any of its good qualities. Although we have had occasion to make a thorough examination of this machine in all its parts, we cannot pretend to describe it in less space than the eight pages occupied in the record of it, accompanied by the different figures in the drawings.

2. For improvements in *Fire Arms;* Benjamin F. Smith, South Hadley, Hampshire county, Massachusetts, December 5.

"The principal feature in which this gun varies from those in com-

mon use, consists in igniting the charge within the cartridge with which the gun is loaded."

The cartridges are formed in the following manner. The outer casing is of paper, formed to suit the caliber of the gun; within this is placed the proper quantity of powder, and next to the powder is placed the torpedo, or wad, into the centre of the lower end of which is inserted a small quantity of percussion powder, which ignites by being pierced with the point of a needle. This needle is to be forced in by the action of the lock, through the centre of the charge of powder, and into the wad in front of it containing the percussion powder, and the discharge is to be thus made.

The whole instrument is described with considerable minuteness, and the patentee says, "I do not claim separately the needle for igniting the charge, or the spur for holding the cartridge, but I do claim the combination of the needle and tumbler, and the combination of the spur, horizontal lever and tumbler as described; and the peculiar construction of the hand lever by which it operates upon the tumbler and spring, and the horizontal lever at the same time, for the purpose of removing the needle and spur, so as to admit the cartridge and cocking the gun at the same operation."

We are aware that the foregoing claim will not explain the particular construction of the parts; but we think that enough has been said to lead to the conclusion that however ingeniously the parts may have been contrived, there is but little probability of this gun being brought into general use.

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3. For improvements in *Railway Bars;* Edward Tilghman, Civil Engineer, city of Philadelphia, December 5.

"The nature of my improvement is in the so forming the bar that there shall be a reduction of the height usually given to the T rail, between its head, and the base on which it rests, thereby diminishing the leverage of the rail, whilst its strength and its capability of being firmly secured to the cross tie are provided for by the addition of a rib directly under the centre of the base, which may be made plain, trapezoidical, or with a lower web, as practiced in many English edge rails. To fasten this rail I insert the lower rib thereof in gains cut in the cross ties, at the lower part of which gains there is a suitable recess for one side of the lower web; the rail is to be inserted in this gain and wedged securely in its place, where it will be supported conjointly upon the ordinary base, and upon the under part of the lower web."

The claim is to "the addition of the under rib to the T rail, below its base, or seat, in the manner and for the purpose set forth. I do not claim the inserting the lower part of the rail within the thickness of the cross tie, this having been before done, but I do claim the employment of a chair inserted and used in the manner set forth, for the purpose of joining and firmly securing the ends of the railway bars."

The chair referred to consists of a flat plate which is received into two notches, one in the end of each bar, immediately under its base;

the two when put together constituting a mortise that receives said chair, or plate, which is affixed to the cross-ties by bolts or spikes.

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4. For a machine for *Separating Corroded and Uncorroded Lead;* Edward Clark, Saugerties, Ulster county, New York, December 5.

The semi-corroded lead is to be passed between rollers, furnished with grooves, or checkered, so that the uncorroded lead will be stretched, or bended, and again straightened, and thus the corroded parts be separated from that which remains metallic.

The machine is to be put in motion so that each individual roller will turn inward upon its fellow, and downward; and the lead is to pass through between these rollers in a crimped state to the next series, and so on, when it falls upon an endless apron, and is carried away to be again subjected to the corroding process. The claim is to the combination of plain and grooved rollers, and also the revolving apron, brushes, and scrapers, &c.

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5. For a *Spark Arrester;* Nicholas Turbutt, Fredericktown, Frederick county, Maryland, December 7.

Not finding in this instrument any thing which appears likely to overcome the difficulties which have condemned to banishment, most of the members of the family of spark arresters, we shall not take the trouble to describe it, nor will it be of any use to insert the claim.

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6. For a *Cotton Press;* John Price, Nashville, Davidson county, Tennessee, December 7.

The claim made by the patentee is to "the manner in which I have combined the power of the screw, and the levers. That is to say, I claim the first pressing by means of the screw, and then securing the upper follower by means of the compression blocks, and the completing of the operation of pressing by the two leavers acting upon the lower follower, in the manner described, said levers being drawn down by any adequate power; I claim the particular combination of the swivel and its appendages, for raising the lever."

The pressing screw is placed vertically, and descends by turning a lever, or cross head, as in many other presses for cotton. When this screw has compressed the cotton to the extent of its capacity, a follower beneath the cotton bale, is forced up by means of two levers which have their fulcra in the cheeks of the press, their short arms under the follower, and their long ends extending upwards at an angle say of 40° on each side; these by being drawn down force the lower follower up, and give additional pressure to the bale.

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7. For a *Franklin Cooking Stove;* Abner R. King, Parma, Monroe county, New York, December 12.

"The nature of my improvement consists in a new and useful combination of a swinging damper in the back plate of a common Franklin stove." The manner in which the patentee carries out his design of adding a cooking apparatus to the back part of, or behind, the ordi-

nary Franklin stove, occupies several pages in description, referring to ten figures in the drawing. The claim is made by letters of reference to the respective parts, and need not be given. To us the arrangement appears to be such as will afford little advantage in cooking, whilst the stove itself will be an inconvenient article. The idea of combining an open Franklin with a cooking stove is not new, it has been often attempted, but has never gone into extensive use.

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8. For a *Fracture Apparatus;* Horson M. Allaben, Middletown, Delaware county, New York, December 12.

The claim is to "the combination of the splint, foot-board, and extension roller, with the fracture bed, or chair." This apparatus consists of a bed, or couch, on which the patient is to lie, and which is furnished with the devices rendered necessary, or convenient, by his position and state; to this is also appended the apparatus required for cradling, and giving extension to, a fractured limb. The description occupies ten large pages, which we shall not attempt to epitomize. Such an instrument, if it offers any advantages, we always think ought to be given to the public, especially if they are devised by those in the practice of the healing art. Perhaps we are wrong in this conclusion, and we are willing to be thought so to be.

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9. For an improvement on *Bedsteads;* Benijah Bosworth, Fayette county, Kentucky, December 14.

This patent is for the mode of fastening the posts and rails together, and of tightening the sacking bottom. The rails are to be round, and have round tenons on their ends; the sacking bottom is to be attached to them by wooden pins and eyelet holes; and on the part which will become the under part of each rail there are to be projecting pins inserted, three or four inches from each end, making in all eight such pins, an inch in diameter and two in length, with a neck turned near their outer end. Round these pins cords are to pass like those used for tightening a frame saw, and the cords are to be twisted by means of a stick of wood, in the same manner, and thus the sacking is to be tightened.

The claim is to "the method herein described of tightening the sacking bottoms of bedsteads by means of the rope attached to the pins projecting from the under sides of the rails, and twisted by a stick."

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10. For a *Visceral Supporter;* Benjamin Reynolds, Camden, South Carolina, December 14.

The patentee calls this the *Gerenteron, or Visceral Supporter*, and has given a description, and dissertation extending through fifteen pages of record. His claims are the following.

"1st. Constructing the back pad plate a little raised on each side of the centre so as to form a recess on the under side that the spine may be safely lodged therein, in combination with the vertical hinge in the centre, permitting each side to fold down so as readily to adapt itself on each side of the spine, to any shape of the back.

"2nd. The combination of the hip springs, constructed and arranged as described, with the front and back pad, the whole being arranged and operating in the manner set forth.

"3rd. The mode of adjusting the hip springs on the front pads, as described.

"4th. The mode of adjusting the front pads so as to adapt them to any sized abdomen.

"5th. The construction of the pad for supporting the perineum with an elliptic spring in the centre, as described."

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11. For *Bedstead and other frame work fastenings;* Joseph Rodefer, Cincinnati, Ohio, December 18.

The claim will afford a general idea of the bedstead fastening referred to, and which is called an *improvement.*

"I not claim to be the inventor of the mode of fastening the rails of bedsteads into the posts by means of a bolt with the segment of a screw on its end projecting from the former, and secured into a mortise in the latter, this having, as I am informed, been previously patented. But what I do claim is the mode herein described, that is to say, having the segment of the screw on the end of one rail embrace a screw on a projection from the end of the screw bolt attached to the adjoining rail, as herein described."

New modes of fastening bedsteads are frequently brought forward, and those who devise them no doubt attach great importance to them; they hope, at least, that others will be induced to do so. After examining through the whole catalogue of fastenings we have not met with one which we would prefer to the old fashioned bedstead screw, when well made, so as to fit the nuts indiscriminately. When the saving of twenty-five cents in a set of eight screws is made an object, they will be inferior in quality, with bad threads, and irregular in size, and this is the main source of objection to them; but if we wanted bedsteads we would take care to have them furnished with good screws and nuts of the common kind.

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12. For an improved *Silk Loom;* Cornelius Bergen, city of Brooklyn, New York, December 18.

Although the loom as improved does not vary, in general, from others, the description of it is given at much length in the specification, which concludes with the following claims. "1st. The employment of the cams with double sections in connection with the arrangement of levers and springs for the purpose of driving the shuttles, as described. 2nd. The making of the batten is two parts for two or more rows or tiers of shuttles, and, in combination therewith, the manner of throwing the shuttles by means of three drivers, one acting as the main driver, by the action of which the other two are driven, as described. 3rd. The arrangement of levers, springs, and cams, for raising and lowering the shuttles, in combination with the batten; the cams to be dispensed with when working by hand, as described."

13. For a *Cheese Press;* William W. Townsend, Shoreham, Vermont, December 18.

The claim is to "the method of applying the weight to the press, by having a cord and a loop, ring, or something equivalent thereto, attached to the weight; the former for the purpose of winding up a weight by passing over a pulley, or pulleys, and the latter to attach the weight to the lever; the whole being constructed substantially as set forth;" which construction consists in the particular manner in which the parts are arranged, which possesses so little of the attribute of invention as to render it difficult to find for what the patent was granted, and, therefore, very easy to avoid interferance without evading or invading any vested right.

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14. For a *Burner for Burning Pine Knots;* John Price, Nashville, Tennessee, December 18.

This burner is made much like the common old fashioned iron candlestick, but large, so as to hold a pine knot: and it is pierced with holes below the holding part, to give the requisite current of air. A funnel is to be placed over it, to carry off the smoke.

The claim is to "the use of a vertical tube, or other suitably formed body, perforated with holes for the admission of air to the burning pine knot, light wood, or other analogous material, which is to be placed therein, as herein set forth, and the burner set under a funnel and smoke pipe, or other analogous fixture."

A contrivance for burning pine knots, or light wood, may appear to be a trifling affair to those who live in the region of oil, tallow, and spermaceti; but the millions, whose only artificial light is "*light* wood," in the west, and in the south, may think otherwise, and although there is no great display of mechanical talent in the device referred to, it may make up in utility what it lacks in invention, and furnish a convenient mode of effecting that which is now effected in a very rude and inconvenient way.

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15. For a *Spring Bolt Shutter Fastening;* George Smith, city of Philadelphia, December 18.

The whole specification of this patent is contained in a small compass, and is as follows:

"The nature of my invention consists in attaching to the plate on which the bolt is stapled, a guard or lock for a key, which operates on a spring similar to a spring lock. The spring is set on the under side of the bolt plate, with a catch fixed to the spring; when the bolt is shoved home, the catch springs up into a corresponding notch cut in the bolt, so that it cannot be unbolted without a key to press the spring catch out of the notch in the bolt. The bolt in other respects has the usual plate and staples. The above particulars will enable any one skilled in the art, to make and use my invention.—What I claim as my invention, and desire to secure by letters patent, is the employment of the spring catch opened by a key, acting on its sloped face,

and attached to the back of the bolt plate, in combination with the bolt, herein described."

We apprehend that the necessity for using a key for a shutter fastening will be a fatal objection to its general adoption, whatever might be its merits on other points.

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16. For a *Smut Machine;* Samuel W. Foster, Scio, Washtenaw county, Michigan, December 21.

"The nature of my invention consists in constructing a floor of the cylinder with a rim or coller, around the shaft, for the purpose of preventing the grain from passing out between the shaft and cylinder; and in combination therewith, adapting a disk to the aforesaid rim, or collar, by countersinking it, by which means a trough or channel is formed for the grain, in which it is retained and operated upon with more effect than if the bottom of the cylinder were a perfect plane."

The grain is to be fed in on the upper side of a vertical cylinder, against the rough and preforated sides of which it is thrown by revolving arms, and beneath them it is rubbed between projecting points on the bottom of the cylinder and revolving rubbers. The difference between this and some other smut machines is small, and the claims are limited to certain minor arrangements, the principal of which are designated in the above extract stating the nature of the invention.

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17. For *Manufacturing Needles;* Abel Morrall, Great Britain, December 21.

"My improvement in making or manufacturing needles, consists in an improved mode of clearing and finishing the eyes of sewing needles, by removing any burs, feathers, or sharp edges, from the insides of the eyes, of such needles, which, without being so cleared and finished would be subject to cut the thread in the operation of sewing." "The invention consists in the spitting or stringing of needles upon a steel or other wire, or any suitable substance which may be passed through the eyes thereof, and which either by means of edges or teeth formed thereon, or by the application of some grinding or polishing material thereto, shall remove the asperities from said eyes and render them perfectly smooth, by giving to said needles, while so strung, a shaking or reciprocating motion, as set forth."

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18. For a *Self Acting Safety Valve;* John P. Bakewell, city of Pittsburgh, Pennsylvania, December 21.

"The nature of my invention consists in a mode or method of fastening and securing the standard, or upright, which is connected with the fulcrum, pivot, or turning point, of the beam, or lever, of a common safety valve, in such a manner as that the heavier the weight may be which is placed upon the opposite, or long arm of the beam, for the purpose of keeping the valve closed, the more certain and effectual shall be the operation of the apparatus in opening the valve whenever the boiler, or generators, shall have been heated to such a degree of temperature as may be considered dangerous, or liable to become so."

A fusible metallic alloy is to be used in this apparatus, by the melting of which at a given temperature it is intended to insure the operation of the apparatus; the use of this metallic alloy is not claimed, "or the combination of a vertical cord, or stem, therewith,—or their further combination with the lever or beam of the safety valve, as these are not new, and are claimed by Mr. Oliver Evans, as his invention." But the patentee claims "the mode in which he has arranged the several parts of the apparatus; that is to say, the attachment or connexion of a rod, or stem, to the end of the lever or beam of a safety valve, in such a way as that it shall be the fulcrum, pivot, or turning point of the beam as long as the alloy remains unfused. And the placing a standard or upright between the safety valve and the weighted end of the lever, to which the beam shall shift its fulcrum or pivot whenever the alloy shall become fused, or melted."

There is, it seems, considerable resemblance between the foregoing plan and that patented by Mr. Evans, but the two were considered in the office as sufficiently different to justify the grant of a patent in the present case; whether this question has been made one of legal investigation we are not informed, and prefer not in the present state of the question, to express any opinion of our own, without being authoritatively called upon so to do.

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19. For constructing *Portable Houses for Transportation;* Frederick S. Barnard, city of Philadelphia, December 21.

The point claimed is "the completing the sides, ends, floors, roofs, &c., separately, and completely finished, to be put together, as described."

The particular manner of connecting the parts as given by the patentee need not be detailed; and we suppose that any good carpenter would find it easy to put his work together in modes of his own devising, without interfering with any vested right, if such there are which can be sustained. We are apprehensive also that it will rarely be found convenient to transport the parts of houses in such large masses as would be required on the proposed plan.

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20. For an improved *Wheel for Carriages;* Elisha Talles, city of Hartford, Connecticut, December 27.

The wheel is denominated a *Metallic Suspension Wheel;* and after describing it, the patentee says that he does "not claim the suspension principle, or the making any part of it of metal; or any thing in the shape of the spokes, or the securing them at each end by nuts; but I do claim as my invention and improvement, 1st. The rim of the wheel of the form and shape hereinbefore described. 2nd. The furnishing a metallic hub with a box, or boxing, which can be replaced when worn, and secured in its place, as described. 3rd. The sand valves in the manner and for the purpose described."

The rim of the wheel is so formed as to have a groove, or channel, around it, which is to receive wooden felloes, and these are to be secured in their place by hoop tire, in the usual way. The hub is cast

with a perforation large enough to receive a metallic box, or boxes, for the axle to run in. The "sand valves" are washers, with rims, borne up by springs against each end of the hub, to prevent the entrance of dirt of any kind, and to keep in the oil.

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21. For *Dressing Paper Pulp;* Nathaniel Hebard, Dorchester, Norfolk county, Massachusetts, December 27.

The ordinary pulp dresser, consists of a plate of metal having numerous narrow slots cut along it, for straining the pulp. In cleansing these out when they become choaked, the openings are gradually widened, and the instrument injured. The object of this invention is so to construct this instrument as that the openings may be narrowed and widened at pleasure, and set to any degree of fineness. For this purpose, strips of metal, of equal widths, are attached to a frame by joint pins at one of their ends, and at the other by similar joint pins, to a sliding bar. When the strips stand at a right angle with the part of the frame to which they are jointed, they are at sufficient distance apart to clear them from all obstructing matter, and by means of the sliding bar to which they are jointed at the opposite end, they may be made to approach each other in any required degree. The claim is to this arrangement of the parts.

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22. For an improved *Rail Road Chair;* Britton M. Evans, city of Lancaster, Pennsylvania, December 27.

This chair is intended to obviate the necessity of wedging the Wigan rail. The chair is to be cast in two parts, one of its sides, or cheeks, being separate from the other, and being removed to put in the rail; when so placed, the loose cheek is driven in, and the rail thereby confined; the patentee says, "I would have it understood that I am aware that rail road chairs have been made with a movable jaw, and secured by means of wedges; I do not, therefore, claim that as my invention; but what I do claim as my invention, and desire to secure by letters patent, is the making of the movable jaw with a dovetail to fit into a corresponding slide in the chair, and secured by a pin, as described."

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23. For a *Socket for holding Tools;* Herrick Aikin, Franklin, Merrimack county, New Hampshire, December 27.

This socket varies but little from others that have been made for holding awls and other tools, and is in itself a subject of so little importance, excepting to the patentee, as not to require a particular description.

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24. For a *Cooking Stove;* George D. Boyce, West Wareham, Plymouth county, Massachusetts, December 27.

This stove is in the ordinary form of those having a fire chamber in front, with an oven in its rear, and boiler holes at top. The claim, therefore, is confined to certain special arrangements; such as to the

manner of arranging the flues and dampers; the dividing the fire chamber into two parts, so that the fire space may be limited when required; and to the manner of combining a pipe for carrying off the vapours, with a sliding smoke pipe.

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25. For a *Truss for a Bridge;* Herman Haupt, York, York county, Pennsylvania, December 27.

"The distinguishing feature of the proposed improvement, is that no counterbraces are used, and the ties are in both straight and curved bridges, perpendicular to the lower chord, the pieces being of the size and arrangement similar to that which is usual for lattice braces."

"What I claim as my invention is the construction of a lattice bridge without counter braces, but consisting simply of braces inclined at any proper angle, and ties which are perpendicular to the lower chord, the chords being either straight or curved."

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26. For an improvement in *Bee Hives;* William M. Hall, Wallingford, New Haven county, Connecticut, December 27.

The object of this invention is so to construct the hive as that it will discharge the worms and other filth that may infect it. To effect this, a double inclined plane is placed at the bottom of this hive, by means of which the discharge is to take place. There is to be an opening of about half an inch at the junction of these planes, through which the bees may enter, and the foreign matters will fall. The claim is to "the protecting base, made with inclined planes, substantially in the manner and for the purposes specified."

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27. For an improved *Spark Arrester;* Thomas Raeney, city of Philadelphia, December 28.

This spark arrester operates upon the same principle with that of Mr. Briscoe, the specification of which was published in vol. xxiv. p. 236, of the last series; but the improvement consists in greatly enlarging the space allowed for the escape of the draught, through inverted cones of wire gauze, or of perforated metal inserted in a cap plate forming the top of the chimney. Mr. Briscoe used but one inverted cone of this kind. The patentee says, that "in an apparatus of this kind I have used eight such perforated cones; the center cone at its upper or open end is eleven inches in diameter, and twenty-one inches deep to its angular point or apex, with seven surrounding cones, eight inches in diameter at their open ends, and thirteen to their angular points."

"I am aware that the top or covering of a cap, or hood, has been made of wire gauze, in the form of a single inverted cone or curved segment of a hollow sphere; but it is not possible with a single cone to obtain sufficient escape surface for the draft. I do not, therefore, claim the merely giving to the covering of such a cap the form of an inverted cone; but what I do claim, is the inserting of a number of such cones of perforated metal or wire gauze into suitable openings in the plate of metal which forms the covering, or top, of such a hood

or cap, for the purpose of giving sufficient surface for the passage of the draft through the perforations or meshes of such cones. I also claim, in combination with a number of cones arranged and perforated as described, the perforating of the upper sides of the hood, or cap, said perforations being surrounded by a rim retiring from said hood, or cap, and rising up above the upper surface of the top plate thereof, as set forth."

We have repeatedly heard favourable reports of the operation of this instrument, which has continued in use, and that is more than can be said of a number of others.

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28. For a *Blowing Apparatus for Furnaces, &c.;* Frederick R. Dimpfel, city of New York, December 28.

The blowing wheel in this apparatus resembles that in ordinary use, but "between the wind wheel and the outer case, a space is left which may be denominated the air chamber. In this space, as also in and around the wind wheel generally, the air will become condensed by the rapid motion of the wheel, and not being able to escape in consequence of the closure between the collar and the outer case, as described, it may be made to exert a pressure of several pounds to the square inch, by regulating the escape opening."

The claims are to "the enclosing of the vanes of the wind wheel with circular sides or rims, between which and the outer case there is a space left, as described; and the attaching a collar to said sides or rims, to admit air to the revolving vanes, said collars being made to run air tight, to prevent the escape of air from the air chamber. The whole being constructed and arranged in the manner set forth."

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29. For an improvement in *Umbrellas and Parasols;* Elisha Hale, Newburg, Orange county, New York, December 28.

This umbrella is constructed so that it can be folded, and slid together in such a manner as that it shall not occupy more than half the length required for those made in the ordinary way.

The claim is to "the forming of the staff of an umbrella or parasol, of two tubes, or of one tube and one solid piece of nearly equal lengths, having springs and catches on them, and sliding one into the other for the purpose of shortening them in the manner of telescope tubes, and in combination therewith, the forming the metallic or other spreaders of an umbrella or parasol, with a division in them, and united by clasps having springs and catches on them, and sliding one on the other to reduce them to nearly one half their extended length, in manner set forth."

There is in the possession of a member of our family, an umbrella which has seen at least forty years service, which possesses all the attributes of that above described; and this is not the only one of the kind that we have seen. So far as the sliding tubes are concerned, we have seen many of such umbrellas and parasols constructed for traveling; but the one first spoken of has the joints in the spreaders, and was, we suppose, made under an English patent. The present

patentee, is, no doubt, the inventor of what he describes and claims, but he has the misfortune of not being the *first inventor*, by a period of about half a century.

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30. For a *Sifter of Coal and Ashes;* Horace Welles, Hartford, Hartford county, Connecticut, December 31.

This apparatus consists of a box of sheet metal somewhat deeper and higher than the ash drawer of the stove, the coal and ashes from which are to be sifted. There is an opening in the metallic case fitted for receiving the drawer with its contents, and when in place, the sifter is to be inverted, and upon shaking it, the ashes will pass through a riddle, formed by a perforated plate, or by bars, fixed in the box, so as to cover the top of the drawer. After this shaking, the box is to be turned on its back end, to allow the ashes to pass into a space behind the drawer, which space, from the length given to the box, forms a suitable receptacle for them. The case is next to be turned on its bottom, and the drawer containing the coals, withdrawn, when the ashes may be thrown out by turning the box on its front. The claim is to the combination of the respective parts, as above described. We do not wish to purchase one of these sifters, it has too many conveniences about it.

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31. For a *Tape, or Chalk Line Winder;* Gerard Sickles, Middletown, Middlesex county, Connecticut, December 31.

This winder consists of a cylindrical bobbin, upon which the tape, or line, is to be wound, and which, we suppose, is to be made of tin plate, or other sheet metal. It is inserted within a cylindrical case, through which there is a slat, or hole, for the passage of the tape, or line. The inner cylinder, or bobbin, is hollow, and to this the inner end of the tape, or line, is attached. A ring, into which to pass the end of the finger, serves to give a revolving motion to the bobbin, when the line is to be wound on to it. The claim is to "the mode described, of constructing a reel without a shaft, revolving within a case."

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32. For a *Railway Safety Brake;* George S. Griggs, Roxbury, Norfolk county, Massachusetts, December 31.

(We have cuts of this apparatus, and will give the specification, with some testimonials of its action.)

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33. For a *Substitute for Oil for burning in Lamps;* Isaiah Jennings, city of New York, December 31.

(See specification.)

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34. For a *Hat Colouring Machine;* George M. Johnson, Port Deposit, Cecil county, Maryland, December 31.

This machine very much resembles some of those used for dipping candles, which machines have arms extending out from a vertical shaft, which arms carry the candles to be dipped over the kettles containing

the tallow. Substitute hats for candles, and let the arms have on their ends boards furnished with suitable pegs, by which to confine the hats in place, that are to be dipped into the kettle, and you have the present machine; the arms vibrate and allow of the articles upon them being lowered into the kettles. The object is to immerse into the kettle, and to raise from it a suit of hats, and to swing them round out of the reach of the steam, thus giving them a perfect chance to become cool. The claim is to "the method of putting the suits in and out of the kettle, and swinging the suits round so as to let them cool whilst other suits are colouring, as described."

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35. For an improvement in *Tanning;* Lewis R. Palmer, Maryland, Otsego county, New York, December 31.

This improvement consists of "a machine for changing the hides from one vat to another, and expressing the exhausting liquor therefrom. The nature of the invention consists in a certain new and useful arrangement of loose rollers on an horizontal axle, placed above and parallel with a revolving cylinder, between which the hides are pressed, and by which the exhausted liquors are expressed therefrom, however uneven the surfaces of the hides may be, which cannot be effected by parallel cylinders of equal length."

The claim is to "the before described combination and arrangement of the parallel, loose, revolving rollers with the revolving cylinder placed below the same, between which the hides are drawn for pressing the exhausted liquors therefrom, in the process of tanning leather.

The loose rollers are cylindrical rings arranged side by side on the upper horizontal shaft, the perforations in their centres being of such size as to allow them to play upon the shaft, and to bear, by their separate weights, upon the hide beneath them.

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36. For an improved *Kitchen Range;* Ebenezer Barrows, Mattapoisett, Plymouth county, Massachusetts, December 31.

We cannot, without devoting too much space to the subject, attempt to describe the peculiarities of this range; we know, however, that it has afforded full satisfaction to numbers who have used it in the city of Boston, where it has been extensively introduced.

The claim is to the peculiar arrangement of the valves and flues, with other devices set forth in the specification.

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37. For an improvement in *Constructing Circular Saws;* Menassah Andrews, Bridgewater, and James Sproat, Taunton, Massachusetts, December 31.

The object of this improvement is "to relieve the collar of a circular saw used for the purpose of sawing boards, shingles, and other articles, from the friction occasioned by the pressure of the article sawed, as it is separated from the block upon the collar of the saw." To effect this, a stationary curved plate is fixed to the frame of the machine, at the back of the saw, against which plate the stuff sawed is to bear,

as it is curved off from the saw, instead of bearing against the collar. The edge of this plate, nearest to the edge of the saw, is received behind a shoulder, or offset in the collar, thus insuring the end of the piece sawed, a passage on to the face of the plate.

The claim is to "the countersink in the collar, as described, and the insertion of the stationary plate, or reliever, as described, in such manner as to receive upon its edge the article sawed, as it is separated from the block."

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38. For *Cutting Seats, Slats, or Grooves, in Hubs, &c.;* Thomas J. Butler, Johnstown, Cambria county, Pennsylvania, December 31.

By turning to vol. xix. p. 30, of the last series, a specification of an apparatus for the same purpose with that above named, will be found, as granted to Francis Barker, of Baltimore; not only the purpose, but the means of accomplishing it, are substantially the same in the two plans. The date of Mr. Barker's patent is not mentioned, as it was probably among those granted a little time previously to the burning of the office. The specification of Mr. Butler's patent was prepared by the editor, who, at the time of writing it, was fully impressed with the conviction that the apparatus had been already patented; but it was not to be found in the office, and from the want of a date, and place on the list, it was overlooked both by the editor, and in the patent office; a kind of accident which is not of frequent occurrence.

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39. For *Propelling Steamboats;* Benjamin D. Beecher, Prospect, New Haven county, Connecticut, December 31.

The mode of propelling described by the patentee, is intended, principally, for canal boats. "The invention consists in constructing the bow, or fore part of the boat, so as to accommodate the screw or other propellers which I place there, which are intended, by their particular position, and mode of action, to draw the water directly from the bow, and to give it, as it passes towards the stern, such a direction as shall greatly diminish the resistance offered to the passage of the boat." The propelling is to be, in general, effected by means of two spiral or screw wheels, placed immediately in front, so as to extend completely out to the cutwater; and the claim is to "the manner of locating the two propellers in the bows of the boat, in combination with the manner in which I construct and extend the bottom of the boat forward, and thus causing the propellers to act upon the water in a direction inclined from each other, in the manner, and for the purpose, set forth."

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40. For preserving the *Equilibrium of Steamboats;* Samuel M. Purse, and Martin Staley, Ashley, Pike county, Missouri, December 31.

The claim shows pretty clearly the nature of this invention, and is in the following words. "What we claim as our invention, and

desire to secure by letters patent, is the preserving the equilibrium or trim of steamboats, by means of an apparatus operating substantially in the manner of that herein described; that is to say, the combination of a pendulous weight, clutch, gearing, and weighted carriage, or suspended weights, as set forth, for the purpose of preserving the trim of boats, and thus improving their speed, and obviating a frequent cause of explosions."

A shaft is sustained on the deck of the vessel in the direction of its length; and from this is suspended a pendulous weight, by the swaying of which, from side to side, the shaft will be turned partially around. This shaft is geared into a rack on the bottom of a loaded truck, placed on ways across the deck, which will be moved in a direction opposite to that towards which the pendulum swings. The shaft may also be geared to a crane carrying a suspended weight, which will consequently be swung from side to side, as required.

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41. For an improvement in *Fire Arms;* Silas Day, and Samuel Hall, city of New York, December 31.

The claim under this patent is to "the method of retaining the extra breech in its place in the barrel, by means of the projection on the extra breech, to which is attached the nipple, fitting into a corresponding recess in the breech plate of the barrel; but we do not claim as our invention the entire extra, or movable breech, which contains the charge." We do not think it necessary to give further particulars, at present, and doubt whether they will ever be called for.

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42. For an improved *Wool Carding Machine;* Nathan Freeman, city of Lowell, Massachusetts, December 31.

This improvement consists, mainly, in dispensing with the upper feeding roller, and placing in its stead, and between the remaining feeding roller and the main cylinder, a bar, so formed as to be nearly in contact with the carding cylinder, and allowing room between it and the feed roller for the passage of the wool, which space diminishes from the point at which the wool enters, to the point of its delivery on to the carding cylinder, which is in a line with the axis of the cylinder and roller. The apparatus is very clearly described; and in its use it is said that "the wool being conveyed and supplied to the feeding roller by means of an endless apron, or drawings, or bats, or in any other convenient way, is carried towards the end of the lip of the bar, and while pressed between it and the feeding roller, and passing the end or edge of the lip is operated upon by the teeth of the main cylinder, tumbler, or carding cylinder, as the case may be, and the fibres of the wool are broken, separated, straightened, and operated upon, and the knobs of wool are disentangled, so as to card the wool better and more effectually than it can be done in the ordinary way."

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43. For a machine for *Manufacturing Lead Pipes;* Joseph C. Vaughan, and Frederick Leach, Tioga, Tioga county, New York, December 31.

This is a rolling apparatus for rolling pipes of cast lead, so as to reduce them in size. There are four rollers consisting of disks of metal of the proper thickness for combining them together, so that they shall, when properly fixed, leave an opening at the place of junction of their peripheries, of the size and form of the exterior of the pipe; for this purpose their edges are fluted in such manner as that each constitutes a fourth of a circle. These four rollers are so placed as that they shall each stand at right angles to the two which are next to it, and they meet by a mitre joint at their edges. A vertical core, or mandrel, is fixed to the frame work of the machine, its lower end passing between the rollers. Upon this mandrel the cast lead pipe is to be placed, and the rollers being properly geared, and made to revolve, the pipe will be rolled out to the desired size. The mandrel is to be made hollow, so as to contain oil, a portion of which is allowed to ooze through small openings at its lower end.

"What we claim as our invention, is the employment of four rollers in combination with the fixed mandrel, in the manner, and for the purpose, herein described; and also the making of the mandrel hollow from the top to near the bottom, to contain oil, and provided with small holes to allow the oil to percolate, and thereby prevent the lead from adhering to the iron."

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44. For a *Cooking Stove;* John L. Lathrop, Provincetown, Barnstable county, Massachusetts, December 31.

This stove is to be made in the form of a Franklin, but is to be furnished with an oven, and other means of cooking; its appearance is therefore more like that of the old fashioned caboose, than of a Franklin stove. We shall not enter into any description of it, but only give the claim, which is to "the combination and arrangement of an upper and a lower diagonal partition, for the purpose of causing the smoke to pass around the oven, in the manner described."

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45. For a machine for *Cutting Nails;* Henry Waterman, city of New York, State of New York, December 31.

"The intent of this machine is to cut nails with a point somewhat of a blunt chisel form, and to give a shoulder on each side of the head by the cutters, thereby producing a nail that will enter easily, and drive and hold well; such mode of cutting being mostly applicable to that sort of nails called brads." This machine, however, is not intended to be confined to brads, but is to cut such nails also as are represented in the notice of Mr. Walter Hunt's patent, in the list for November, No. 11. The drawings of this machine consist of twelve different figures, by which it is fully represented. The claims are necessarily confined to the special construction adopted by the patentee, as every machinist acquainted with nail machines can construct them to cut such nails; nor is there any claim made to the kind of work performed, but only to the manner of performing it.

Specifications of American Patents.

Specification of a Patent for an Improved Manufacture of Cotton Twine; granted to Jacob Sloat, *Statsburg, Rockland county, New York, November 9th,* 1839.

To all whom it may concern: Be it known, that I, Jacob Sloat, have invented a new and improved manufacture of cotton twine, or cord, by which improvement the liability of such cord to kink, stretch, and untwist, is obviated, its durability is increased, and it is rendered equally applicable to various purposes, with the twine prepared from more costly materials; and I do hereby declare that the following is a full and exact description thereof.

I make my twine of various sizes, and by means of the apparatus ordinarily used for that purpose, and I then subject it to the operation of dressing, employing for this purpose any of the dressing machines used for dressing cotton yarn, to prepare it for being woven in the loom, the operation being similar, excepting that the twine or cord, instead of being wound upon a yarn beam, is to be delivered so as to be wound into balls, or otherwise put up for use. Various compositions of starch, gum, glue, or other materials possessing analogous properties, may be used for dressing, the object being to saturate or coat the twine or cord with any suitable viscous substance, which shall have the effect of causing the fibres of cotton to adhere to each other, and consequently to prevent the kinking, stretching, and untwisting of the strands. I have found a mixture of starch and glue to answer the intended purpose perfectly well, and are not aware that any other material is to be preferred either for utility or economy.

I do not make claim to any new machinery to be used either in the process of spinning the twine or cord, or for the purpose of applying the viscous dressing thereto; but what I do claim as my invention is the applying of the well known process of dressing, to cord or twine prepared from cotton in the ordinary way, whereby such cord or twine is greatly improved in its useful properties, and is thereby rendered an essentially new manufacture.

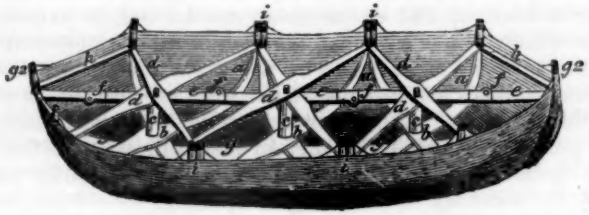
Jacob Sloat.

Specification of a Patent for a Portable Safety Barge and Army Boat; granted to Solomon C. Batchelor, *city of Cincinnati, Ohio, January 20th,* 1841.

To all whom it may concern, be it known, that I, Solomon C. Batchelor, of the city of Cincinnati, in the State of Ohio, have invented an improved boat, which I denominate the portable safety barge and army boat, and I do hereby declare that the following is a full and exact description thereof. My boat or barge is so constructed as to be capable of being doubled up so as to occupy a very small space when it is not in use as a boat. The exterior, instead of planking, consists

of India rubber cloth, or of any other flexible material which is light, readily folded, and impervious to water. When opened out for the purpose of being used, the sides are sustained by suitable ribs of timber, constructed and jointed together in a way to be presently described.

The portion of timber forming the keel is divided into lengths which are connected together by rule joints; and another portion of timber which extends fore and aft, or from stem to stern, directly above the keel and near the upper part of the boat, is in like manner divided and connected by rule joints, so that they may be doubled together, and when opened out, the respective pieces will stand in a straight line, or nearly a straight line; the rule joints connecting the several parts of this timber are so constructed as to open a little beyond a straight line, this forms a kind of lock, as this part acts as a longitudinal stretcher; the two end pieces of the keel curve up so as to constitute a stem and stern post.



The accompanying drawing represents my boat, or barge, in perspective. The pieces of timber which constitute the ribs of my boat or barge, and which are marked *a*, *a*, *a*, consist of hickory, ash, white oak or other tough hard wood, adapted to the purpose; these pieces are to be bent into the form of a bow, so as to constitute, when properly placed, the cross bottom timbers and ribs of the boat; they must, of course, be of such length as will adapt them to the particular purpose to which they are to be applied. These rib pieces are placed in pairs, crossing each other at their middles, as shown at *b*, *b*, *b*, where they work upon joint pins, formed by the lower ends of the vertical standards *c*, *c*, *c*, each of these rib pieces is connected together near its upper end, by a straight stretcher of wood *d*, and when in place, the retrospective pieces *d*, *d*, cross each other, and work on joint pins at the upper ends of the standards *c*, *c*, *c*. The upper fore and aft timbers are marked *e*, *e*, *e*, its parts being connected by rule joints at *f*, *f*, *f*, and it is also jointed to the cross pieces *d*, *d*, by the joint pin upon which they work.

The keel pieces *g*, *g*, *g*, are connected in like manner to the rib pieces *b*, *b*, and work upon joint pins passing through them, and through *b*, *b*, on the lower ends of the standards *c*, *c*; one of the curved end pieces of the keel is seen at g^1, and the upper ends of both of them at g^2, g^2. The two cross pieces *d*, *d*, which are nearest to the ends of the boat, are united by hinge joints to straight pieces of stem

and stern, or bow timber, *h*, *h*, which are hinged at their other ends to the stem and stern posts. Where two ribs meet at the sides of the boat as at *i*, *i*, *i*, they are united by hinge joints; and it will be readily seen that all the timbers may, from the arrangement of joints as above described, be folded together in such manner as that the length occupied by the boat when so folded, will be equal only to that of one of the bow pieces constituting the ribs, and the width only equal to that of three of the cross timbers *d*, *d*, and the thickness of the stern posts; that is, supposing there are three cross pieces to the boat, as in the drawing; but this number may be increased or diminished at pleasure. I have spoken of stem and stern posts; but these terms must be understood as convertible, the two ends of the boat being similar. A boat upon the foregoing plan, which I have constructed, weighs altogether thirty-five pounds, and it is capable of carrying, very readily, a load of two thousand pounds.

Having thus fully described the manner in which I construct my portable safety barge and army boat, what I claim therein as constituting my invention, and desire to secure by letters patent, is the manner in which I have arranged and combined the pieces of timber forming the ribs, the cross pieces by which their ends are sustained, and the longitudinal pieces constituting the keel and the upper timber *e*, *e;* the respective parts being united by joint pins, hinge joints, and rule joints, substantially as herein set forth, so that the whole, when not in use, may be folded together, and be instantly prepared for use by the mere act of unfolding or opening.

SOLOMON C. BATCHELOR.

Specification of a Patent for a new Combination of Ingredients to be used as a Substitute for Oil, for Burning in Lamps; granted to ISAIAH JENNINGS, *city of New York, December* 31*st*, 1839.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the city of New York, have invented or discovered a new combination of ingredients to be used as a substitute for oil and other combustible ingredients, for burning in the various kinds of lamps now in use; and I do hereby declare that the following is a full and exact description thereof.

In the process of distilling whiskey for making alcohol, or high wines, it is now the practice with some distillers to commence the operation by subjecting the whiskey in the still to a much more intense degree of heat than heretofore, and as the progress of rectification proceeds to lower the fire to the ordinary temperature. The effect of this high temperature is, in the first instance, to drive over a liquor possessed of peculiar properties, intimately related to those of the essential oils. The quantity of this liquor obtained from different parcels of whiskey, will differ, but I think that it will vary but little from two or three gallons to the hundred gallons of common whiskey. Its specific gravity is the same, as nearly as may be, with that of spirits of turpentine, and its reaction is, in many cases, similar. It is

extremely high flavoured, and brings over with it all the highly odorous matter contained in the whiskey, and has, consequently, an offensive smell. The reason for adopting this process by the distiller, is, that by driving over this oil, or spirit, which I shall designate by the name of *oil of whiskey*, the trouble and loss consequent upon rectification by charcoal, are avoided, and an equally pure spirit is obtained.

I have been thus particular in the foregoing description, as this peculiar kind of oil or spirit possesses the property of rendering alcohol and spirits of turpentine capable of combining with each other in proportions in which they do not combine when it is not present; and will also cause spirits of turpentine to combine with whiskey, or ordinary proof spirit.

In making my new compound, the spirits of turpentine may be the predominating ingredient, which cannot be the case when the compound of this spirit with alcohol is used alone. The proportions may, of course, admit of some variation, but the following is preferred. Two parts of spirits of turpentine; one of alcohol of 93° above proof, and one of oil of whiskey. Should alcohol of higher proof be used, the proportion of spirits of turpentine may be increased, but this is not deemed desirable. The advantage derived from this oil of whiskey is such, that were it not added, as above, the alcohol must exceed the turpentine in the proportion of about five to one.

I sometimes combine the oil of whiskey with sperm, or other oil, with turpentine, and with alcohol, or with the sperm oil alone; which last combination will take place in any proportions. When I use the four ingredients I prefer to take about four parts of the oil of whiskey, one of sperm or other oil, one of spirits of turpentine, and one of alcohol.

The fluid which I have denominated oil of whiskey, has, heretofore, been thrown away as worthless, but I have, as above stated, applied it to a highly useful purpose, and obtained a combustible fluid affording a brilliant light, at a cost far below that of the ingredients now in use, and which, when combined, as above stated, has not its offensive smell developed, but burns without odour.

What I claim as my invention or discovery, in the above named combination of ingredients, is the use and employment of what I have denominated oil of whiskey with spirits of turpentine, alcohol, or lamp oil, in the manner, and for the purpose, herein set forth.

ISAIAH JENNINGS.

Specification of a Patent for an improved manner of discharging Fire Arms of various kinds; granted to JOSHUA SHAW, *city of Philadelphia, January 30th,* 1841.

To all to whom it may concern: Be it known, that I, Joshua Shaw, of the city of Philadelphia, in the state of Pennsylvania, have invented a new and improved manner of discharging fire arms of various kinds, said improvement being equally applicable, under proper modi-

fications, to the discharge of small arms, such as pistols, fowling pieces, rifles, muskets, and others, and also to the discharging of pieces of ordnance.

In making the discharge, I ignite the powder constituting the charge by means of a percussion cap, charged with fulminating powder in the ordinary way; but when used for the discharging of small arms I employ percussion caps of a size considerably smaller than those in common use; and for the discharge of cannon they need not be larger than those now employed with small arms. A distinguishing feature of my invention is the manner of employing, or using, these caps, which, under all the modifications thereof, is by placing them upon one end of a cylindrical rod, or wire, of steel, which rod, or wire, for distinction sake, I will call a piston; and inserting said piston, with the cap on the end thereof, into a cylindrical opening occupying the place of the ordinary touch hole, or otherwise conveniently situated; said opening being adapted in size to the piston, which is to slide freely, but closely, within it. The cylindrical piston is to be a trifle larger in its diameter than the outside diameter of the cap which is to be placed upon it; its end being turned down, or reduced in size so as to pass into, and to be embraced by the cap. The hole or opening, into which the piston is to pass, is to contain, in some part of it, a piece or pieces of leather, cork, or other elastic substance, which is to embrace the piston, and thus render the passage air and water tight, whilst, at the same time, said material will serve, by its elasticity, to hold the piston in place.

In small arms the hole, or opening, through which the piston passes, may be of equal bore, or diameter, throughout; as the piston is, in some cases, to be of sufficient length to enter the chamber of the barrel, and to extend across it, so that the percussion cap which is placed upon its end may be brought into contact with the interior of the chamber on the side opposite to that at which it entered; and it is manifest that if the outer end of the piston be then struck by a hammer, or mallet, the percussion cap will explode, and the gunpowder will be ignited.

In pieces of ordnance there are sundry objections to the allowing of the piston to extend across the chamber of the gun; and from the thickness of the breach, in arms of this description, a sufficient depth is obtained in the solid metal for the operation of the piston without its entering the chamber of the gun. In using my piston with the percussion cap at its end for the discharging of pieces of ordnance, I bore a hole, in the manner, and generally in the place, of the ordinary touch hole, such hole being of the size of the piston intended to be used, say of three-sixteenths of an inch in diameter, more or less, and extending down nearly to the chamber of the gun, say within a fourth or half of an inch thereof; and through this remaining part I drill a hole of much smaller size, say one sixteenth of an inch, more or less, in diameter, until it enters the chamber. The piston must be of such length as to extend down to the bottom of the larger portion of the bore, and to rise to a sufficient height above the top of it for the action of the hammer by which it is to be struck. Its lower end, or that which

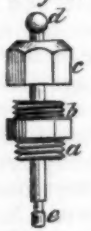
enters the bore, is, as above stated, to be turned down so as to form a nipple for the reception of the percussion cap.

The percussion cap which I use under this modification of my invention, I have improved in such a manner as adapts it especially to the object in view; this improvement consists in the making a small hole, say one sixteenth of an inch in diameter, through the centre of what, in the ordinary cap, is its closed end; this being done before the cap is charged with percussion powder.

When the piston is inserted in the bore, having a percussion cap of the kind just described on its lower end, if the piston be struck by a hammer, or mallet, on its upper end, the cap will explode, and the ignited percussion powder will pass through the hole in the head of the cap, and through the small part of the bore under it, into the chamber of the cannon, where it will ignite the powder.

I sometimes drill a small hole into the end of the piston, in the direction of its axis, which hole may be from an eighth to a fourth of an inch in depth, and of the same size with that in the percussion cap, and also with that leading into the chamber of the gun; this hole is to be filled with common gunpowder, which will be ignited by the percussion powder; by using this device the percussion caps may be very lightly charged with purcussion powder, the gunpower greatly aiding in causing the discharge of the cannon. This is a point of considerable importance, as the destructive influence of the percussion powder upon the parts with which it is in direct contact, is thereby, to a considerable extent, obviated. It may also be remarked that the percussion cap which remains upon the piston after the discharge, has the effect of protecting it, and the adjacent parts, from injury by the percussion powder.

Fig. 1.



2.

I will now exemplify, by reference to the accompanying drawings, the manner in which my improvements may be carried into actual operation. Figs. 1 and 2, represent modes in which it may be conveniently applied to small arms; in fig. 1, *a*, is a perforated screw nut, which screws into the barrel, at the place usually occupied by the touch hole, or in any other preferred situation; the end of this screw is to be flush with the inside of the chamber; *b*, is a screw on the upper part of this nut, upon which there is fitted a screw cap *c*; the cavity in this cap is somewhat deeper than the length of the screw *b*, in order to admit of the insertion of a piece of leather, or of some other elastic substance, through which the stem of the piston *d*, *e*, is to pass. This stem is to be made perfectly cylindrical, and the holes in the nut and

cap through which it passes are to be made perfectly true, and adapted nicely to it in size, so that such pistons may slide in and out easily, and yet have no shake. Fig. 2, shows a similar device, but more simple in its construction; *a*, is a screw nut which screws into the barrel, but does not pass through into the chamber, there being a solid portion of the barrel below it, with the exception of an opening of such size only as to admit the piston to pass through it. The elastic material, under this arrangement is placed beneath the screw *a*, and is pressed between it and the part of the barrel beneath it. The head *f*, of this screw nut, together with its screw part *a*, receives the piston *d*, *e*, as in fig. 1, its whole construction and operation being substantially the same. The length of this piston is, under this arrangement, to be such as to extend across the chamber of the piece to be discharged. The small percussion cap is received on its inner end *e*, and this must be, as before remarked, somewhat smaller in diameter than the piston. These percussion caps are, in other respects, constructed in the ordinary manner.

Any required number of these pistons, armed with their caps, may be conveniently carried by arranging them in holes prepared for their reception in the stock, or breeching part of the gun or pistol, or they may be disposed of in any way which will admit of their being readily applied when wanted.

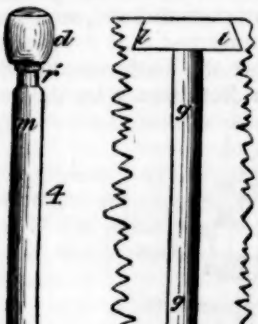


Fig. 3.

Fig. 3, is a section through the touch hole part of the breech, or ventfield of a piece of ordnance, showing the manner in which I drill or bore through this part for the insertion of the piston, and the exploding of the cap; and fig. 4, is the piston; *g*, *g*, is the part of the bore which is to receive the cylindrical piston fig 4; and *h*, the lessened aperture leading from the lower end of *g*, *g*, into the chamber of the gun, thus leaving a shoulder at *i*, *i*, against which the percussion cap is to be forced when the discharge is to take place. I have said that the bore *g*, *g*, should be perfectly cylindrical, and this is true, excepting that there is a slight contraction at its lower end, in the part which embraces the percussion cap at the time of the explosion; this part being made slightly conical, to the height of from an eighth to a quarter of an inch, which causes it to embrace the cap the more closely after the blow, and still allows it to be readily withdrawn, as the slightest motion relieves it from the conical termination.

I have, in the application of my improvement to cannon, devised a very simple mode of using an elastic substance through which the piston is to pass, and by which the entrance through the opening *g*, *g*, is rendered air and water tight. I make a countersink *l*, *l*, at the upper end of the bore *g*, *g*, in which I insert a piece of cork, having a

hole through the middle of it, through which hole the piston will pass, and by which it will be closely embraced. This cork may be firmly held in place by small asperities on the sides of the countersink, by widening the countersink a little towards its bottom, or in various other ways. If preferred an elastic substance may be held down by means of a perforated screw nut inserted in the ventfield, but I think the cork, inserted as above described, is, as I have found it to be, perfectly efficient, and it may be readily and instantaneously renewed. I prefer, in all cases to make the pistons of tempered steel; they are accurately turned, ground, and fitted to the perforations prepared to receive them. In fig. 4, *n*, is a section of the copper cap which is to be placed on the lower end of the piston *m*, *m*, this cap is perforated at *o*, prior to its being charged with percussion powder, the opening being equal in size, or nearly so, to the perforation at *h*. The lower end *p*, of the piston is turned down to receive the cap, and it is diminished in diameter at the part *q*, so as to leave a shoulder at *r*, above which the copper cap rises, and the upper edge of the cap is to be slightly bent inwards so as to embrace this shoulder; and this may be readily effected by holding a piece of steel, say one of the pistons, or a tool kept for the purpose, upon the edge of the cap after it is in place, and rolling it over upon a table. By this means it is made to embrace the piston so firmly as to insure its being withdrawn with it, after the discharge; whilst without this precaution it would be liable to be left behind. The dotted lines at the lower end of the piston show the perforation sometimes made for containing gunpowder.

The discharge is made by allowing a hammer to strike on the head *d*, of the piston, and this may be done by hand, but it will usually be effected by means of a lock, constructed in any convenient form, and adapted to the piece to which it is to be applied.

Having described the manner in which I apply my piston, and its percussion cap for the discharge of pieces of ordnance, I will now observe that I intend sometimes, and shall probably prefer, to adopt a similar arrangement in small arms; that is to say, to use a piston which shall not enter the chamber of such arms, but which shall be contained entirely within the tubular screw nuts, represented in figs. 1 and 2, or within tubular pieces analogous thereto. In this case I shall use also, the perforated percussion caps, like those used for the discharge of cannon, and allow the percussion powder to pass therefrom into the chamber of the pistol, or the gun, through a perforation smaller than that which receives the piston. The whole arrangement of the apparatus being in this case substantially the same with that described in my application of it to cannon; the main difference being in the size only of the respective parts.

From the smallness of the opening through which the discharge is made from the percussion cap into the powder forming the charge, or from the smallness of the section of the piston used in small arms, when said piston is allowed to pass through the chamber, the reaction from the discharge, tending to throw the piston out, will be but small, and it will be held down by the force of the spring acting upon the hammer of the lock, when a lock is used. When the piston is to be

struck by hand, a button attached to the ventfield of the gun, and bearing on the piston near its upper end, may be used for checking the rise of the piston from the force of the discharge.

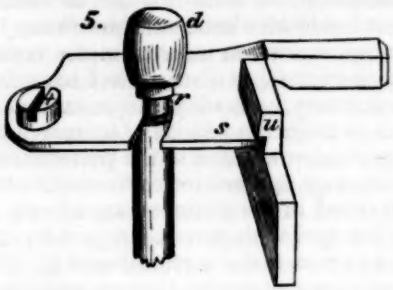


Fig. 5, shows the manner in which the button may be affixed; *d*, is the head of the piston, and immediately under this head there is a shoulder *r*, made by turning the shank of the piston so as to form a neck smaller than the shank; *s* is a steel button which turns on a screw at *t*, and passes under a catch *u*, at its opposite end. The neck of the piston is embraced by the notch in the button *s*, and is thus held from being blown out. The neck is of sufficient length to give the requisite play to the piston, which can be drawn out when the button is turned back.

In cannon and other fire arms constructed as herein described, the vent is not only rendered air and water tight, but the escape of fire and smoke through it is effectually prevented, as has been proved by numerous trials.

Having thus fully described the nature of my improvement, and shown the manner in which I carry the same into operation, what I claim as constituting my invention, and desire to secure by letters patent, is the effecting of the discharge of fire arms by placing a percussion cap on the end of a cylindrical rod, or piston, formed for the purpose, in the manner herein set forth; such piston, with its cap, being made to pass through an opening adapted thereto, either in the body of the breech of the piece to be discharged, or through tubular pieces screwed into, or otherwise attached to it; said piston being of such length as shall adapt it to the respective modifications of my apparatus, as above described; that is to say, I claim the passing of such a piston through a tubular opening allowing it to reach across the chamber, as in my first described modification. Or I pass it into a cylindrical opening extending nearly to the chamber where a shoulder is formed by diminishing the size of the aperture, in the manner, and for the purpose set forth; the respective parts concerned in the discharge, being constructed, and operating substantially as herein fully made known. I claim, likewise, the improvement in the percussion cap, consisting of the perforation through the middle of what is usually its closed end, in the manner, and for the purpose described.

JOSHUA SHAW.

Electricity from Steam.

At a stated meeting of the American Philosophical Society, held December 18th, 1840, Dr. Patterson called the attention of the Society to the subject of the evolution of electricity from steam, mentioned at the last meeting, and stated that the experiments made lately in England had been successfully repeated by Mr. Peale, Mr. Saxton, and himself, at the United States' Mint.

Dr. Patterson said, that their first attempts were to collect electricity from the steam as it issued from a gauge-cock, near the surface of the water, in the boiler; but in this case the steam was always accompanied by a spray of water, and the experiments failed. They also failed when the steam was of a low temperature, as it was then condensed immediately upon leaving the boiler, so as to form a cloud of vesicular vapour. In both these cases, the electricity, if evolved at all, would be led back to the boiler—the spray and the vesicular vapour being, as is well known, electrical conductors.

When, on the other hand, high steam was drawn off from a stop-cock far removed from the water in the boiler, it was observed to issue, for some distance, in the form of a transparent gaseous vapour, and, in this case, any insulated body on which it was condensed was always found to be charged with electricity. Thus, if the experimenter stood on an insulating stool, or even on a box or ladder of dry wood, and held an iron ladle, or any other conductor, in the issuing steam, the conductor and the operator became so fully charged with electricity, that thick sparks of a half, three-quarters, and in some instances a whole inch in length, were drawn off; the Leyden jar charged; the shock given to several persons holding hands, &c. The electricity thus produced was found to be always positive.

Dr. Patterson said, that one of the most important conclusions to which the experiments had led, was, that true gaseous steam is a non-conductor of electricity. If it had not been so, the apparatus would not have been insulated, and the electricity excited would have been carried back to the metallic boiler, and thence to the earth.

Dr. Patterson thought it most probable that the electricity, in these experiments, was evolved by the condensation of the steam—the phenomenon being analogous to the evolution of latent heat by the same condensation. He remarked, that as the steam within the boiler was surrounded by conductors, it could not be supposed to contain free electricity, and that on leaving the boiler, the only sources to which the electricity could be ascribed, seemed to be the condensation of the steam, the oxidation of the iron against which it impinges, or the friction of the steam against the air as it rushes through it.

To show that oxidation was not the source of the electricity, the experimenters caused the steam to strike upon a large bar of fine gold (400 oz. in weight,) and the generation of electricity was as abundant

as when they employed an oxidizable metal. The electricity was also evolved by the insulated operator simply holding his hand in the steam as it issued; in which case the steam was condensed upon the hand, and the whole person became charged. Dr. Patterson stated, that this was, in fact, the experiment accidentally made near New Castle, in England, and which has attracted so much attention.

To show that the electricity was not caused by the rushing of the vapour through the air, Dr. Patterson said, that an apparatus was made, consisting of a pipe connected with the stop-cock on the boiler, a portion of about ten inches in length, near the upper end, being of glass, to produce insulation, and the remainder of lead, wound into a helix, like the worm of a still. This helix was immersed in a bucket of water and snow. When the steam was admitted, it became entirely condensed within the pipe, so that there was no rush through the air; yet the production of electricity was as abundant as with the former arrangements.

Dr. Patterson took notice of experiments made, half a century ago, by Volta and Saussure, and afterwards by Cavallo, which proved, to their satisfaction, that electricity was evolved during evaporation and condensation, but which have since been called in question by Pouillet and others, who assert, that a mere change of state, not accompanied by chemical change, never gives rise to electricity. He considered the experiments, now made on a large scale, as favouring, if not confirming, the first opinions entertained on this subject.

Dr. Patterson referred to the satisfactory manner in which these new experiments seem to explain the sources of electricity in the thunder storm, and in volcanic eruptions.

He then related an experiment in which an insulated iron ball, and afterwards a bar of gold, was heated, and a small stream of water poured on it, so as to be formed into steam at its surface. The first experiments seemed to show that the metal was charged with negative electricity, but subsequent trials threw doubts upon this conclusion.

Dr. Patterson also described experiments made to determine whether electricity was given off during the solidification of liquids,—the substances used being melted lead, silver and gold. In every case, however, the gold-leaf electroscope failed to exhibit the presence of any electricity.

Prof. Henry stated that he had not seen the sparks from steam; but that he had obtained feeble electricity from a small ball, partly filled with water, and heated by a lamp. He agreed with Dr. Patterson in the opinion, that the source of the electricity was the change of state, but from water to vapour. There was, however, some doubt on the subject; Pouillet had denied the evolution of electricity from the evaporation of pure water. The facts were interesting, particularly on account of the great intensity of the electricity. The results, obtained by the philosophers, which had been mentioned, indicated electricity of very feeble tension, which could only be observed by the most delicate instruments, but here the sparks were an inch in length. If the vaporization of the water were shown to be the source

of the electricity, Prof. Henry thought that the phenomena might be readily explained by the beautiful theory of Becquerel, in regard to the production of the great intensity of the electricity in the thunder cloud. According to this theory, each particle of the vapour carries up with it into the atmosphere the free electricity, which it receives at the moment of the change of state; this, being diffused through the whole capacity of the air, is of very feeble intensity, although of great quantity; but the condensation of the vapour into a cloud affords a continuous conductor, and consequently the electricity of all the particles of the interior, according to the well known principles of distribution, rushes to the surface of the cloud, and hence the great intensity of the lightning. According to this hypothesis, the insulated conductor, placed in the steam, would act not only as a collector, but also as a condenser of the free, but feeble, electricity of the vapour.

Prof. Henry farther stated, in connection with this subject, that he had been informed by several persons, that they had obtained sparks of electricity from a coal stove during the combustion of anthracite. A case had been stated to him several years ago, which he mentioned to his friend Professor Bache, who informed him that a similar one had fallen under his own notice, in which, however, Prof. Bache had succeeded in tracing the electricity to the silk shirt of the person who drew the spark. Another case had lately been reported to him by an intelligent gentleman, of a stove burning bituminous coal, on board of a steamboat on the Ohio, which afforded amusement to all the passengers during the voyage, by giving sparks of electricity whenever it was touched.

In connection with the facts that had been stated of the production of electricity from steam, Prof. Henry observed that he was now inclined to believe that electricity may also be evolved during the combustion of coal in a stove. But what, he asked, is the source of electricity in this case? Is it combustion, the evaporation of the moisture, or the friction of the hot air on the interior of the pipe?

Dr. Goddard stated, that in the case of a stove, pretty well insulated, his family had amused themselves with drawing sparks half an inch or three quarters of an inch long; and that similar sparks were obtained from the frame of a looking-glass over an open grate, in the house of Dr. Norris, of this city.

Professor Bache remarked, that in the case referred to by Professor Henry, in which sparks of electricity were obtained from a stove, he had satisfied himself that these were owing to the experimenter wearing a silken shirt:—an experimenter, not similarly clad, being unsuccessful.

Dr. Hare ascribed the incredulity and the opinions which he had expressed, when this subject was brought before the Society by Mr. Peale, at the last meeting, to a misapprehension, on his part, as to the circumstances. He considered that the fact of electricity being developed in the case adduced was established. He alluded to the almost incredible case of a lady, who, agreeably to evidence mentioned in Silliman's Journal, gave off sparks of electricity. He stated also the result of an experiment to discover whether electricity was given

off during the rapid evaporation of a saline solution. There was no evidence of excitement. The vessel was of glass.

Mr. Lea had frequently observed sparks from a common grate.

In reference to the results of experiments by Dr. Patterson, in which no evidence of the development of electricity was observed in metals, whilst undergoing a change from the liquid to the solid state, Dr. Goddard observed, that in cases of crystallization on the large scale, as of nitre, in the extensive chemical works of Mr. Wetherill, a beautiful flash of electrical light was apparent.

Professor Rogers suggested, that in ordinary combustion there may be a constant development of electricity, and that means may possibly be found to render it apparent by perfect insulation.

Professor Henry stated, that Pouillet had found that electricity is developed by the combustion of charcoal, and he offered some suggestions as to the mode of rendering the electricity, given off from a stove, apparent, by insulating it both above and below.

Dr. Emerson thought, that the change of state from solid to liquid, and from liquid to solid, might account for various electrical phenomena presented by the animal body. Dr. Hare suggested the difficulty, that the human body is a good conductor; and that without a peculiar organization, analogous to that with which nature has endowed the Torpedo or Gymnotus, it is inconceivable that electrical discharges could arise from vital organization. He believed it was admitted by electricians, that there could be no electrical excitement without the existence of the opposite electricities. Agreeably to the published facts of the case to which he had alluded, the lady was permanently in one state of excitement, generating electricity, as animal heat is generated, and throwing off the excess in sparks.

In the case of the Gymnotus the intensity, Dr. Hare remarked, is so low that sparks are with difficulty rendered apparent at a kerf made by a knife in tinfoil; of course, the sparks alleged to be given by the lady were vastly more intense. From the Gymnotus, sparks could only be received by forming a circuit with a portion of the organic series situate parallel to the spine. Contact in a transverse direction was not productive of any discharge.

Proceedings Amer. Philos. Soc.

Corrosion of Cast Iron and Wrought Iron in Water. *By* ROBERT MALLET, A. I. C. E., *&c.*

[From the "Transactions of the Institution of Civil Engineers."]

This communication is one of those forwarded to the institution in consequence of the council having considered this subject a suitable one to compete for the Telford Premiums; and the author having been long engaged in making experiments on this subject, at the request of the British Association, refers, in the introductory part of this paper, to the contents of that report, which may be viewed as a "*précis*" of the state of our knowledge on the subject to the year 1839, together with original researches, forming the basis of the present results. This communication is accompanied by a most elabo-

rate set of tables of results; but these laborious investigations being yet in progress, the author directs his special attention to so much only of the subject as may be necessary for their elucidation—divesting his remarks as much as possible of a purely chemical character, and confining them to those practical conclusions which are of immediate use and importance to the engineer.

The tables of results are altogether twelve in number. The first five contain the data and results of the chemical or corroding action of sea and fresh water on cast and wrought iron under five several conditions, during a period of a year and ten months; and these five series of experiments are so co-ordinate with each other as to form one connected and comparable whole, whence the relative rates and absolute amounts of corrosion of cast and wrought iron—by, 1, clear sea water; 2, foul sea water; 3, clear sea water at temperature 115° F.; 4, foul river water; and, 5, clear river water—may be ascertained. The corrosive action of water and air combined produces on the surface of cast or wrought iron a state of rust possessing one of the five following characteristics—1, uniform; 2, uniform with plumbago; 3, local; 4, local pitted; 5, tubular—or of two or more of these characteristic conditions in combination; these facts, for eighty-two different specimens of British and Irish cast iron, together with their original external characters, mode in which they were cast, specific gravity, dimension and weight before and after immersion, loss of weight per square inch of surface—this loss referred to a standard bar, and the weight of water absorbed for clear sea water, compose Table I. The four subsequent tables contain similar results for specimens of iron immersed under the other four conditions mentioned above. These five tables contain also the results of the corrosion of certain cast irons protected by either of ten several paints or varnishes, the results of which are comparable with those for the unprotected iron. Table VI. exhibits a general comparison of the results set forth in the preceding tables for specimens of iron one inch thick, and reduced to one common or equal period of immersion. Table VII. shows the average loss of all varieties of cast iron experimented on per square inch of surface. Table VIII. the average calculated amount of corrosion (assumed uniform) of various specimens of cast and wrought iron per superficial foot of surface at the end of one century. From these tables it appears that the metallic destruction or corrosion of the iron is a maximum, in clear sea water, of the temperature of 115° F.—that it is nearly as great in foul sea water—and a minimum in clear fresh river water.

Iron, under certain circumstances, is subject to a peculiar increase of corrosive action—as, for instance, cast iron piling at the mouth of tidal rivers—from the following cause. The salt water being of greater density than the fresh, forms at certain times of tide an under current, while the upper, or surface water, is fresh; these two strata of different constitution coming in contact with the metal, a voltaic pile of one solid and two fluid elements is formed; one portion of the metal will be in a positive state of electrical action with respect to the other, and the corrosive action on the former portion is augmented.

The lower end of an iron pile, for instance, under the circumstances just mentioned, will be positive with respect to the other, and the corrosion of the lower part will be augmented by the negative state of the upper portion, while the upper will be itself preserved in the same proportion. From this theoretical view may be deduced the important practical conclusion, that the lower parts of all castings, subject to this increased action, should have increased scantling.

The increased corrosive action of foul sea water may be referred to the quantity of hydrosulphuric acid disengaged from putrifying animal matter in the mud, converting the hydrated oxides and carbonate of iron into various sulphurets, which again are rapidly oxidised further under certain conditions, and, becoming sulphates, are washed away—hence the rapid decay of iron in the sewage of large cities, and of the bolts of marine engines exposed to the bilge water. The corrosive action being least in fresh water, may be partly referred to this being a worse voltaic conducting fluid than salt water.

It appears also that wrought iron suffers the greatest loss by corrosion in hot sea water—which fact has led the author to inquiries, with reference to marine boilers, at what point of concentration of the salt water, whether when most dilute, after the common salt has begun to deposit, or at a farther stage of concentration, the corrosive action on wrought iron is the greatest, and he points out the important practical use which can be made of this information. It appears also, that the removal of the exterior skin of a casting greatly increases the corrosive action of salt water and its combined air, so that the index of corrosion under these circumstances is not much less than that of wrought iron, and in clear river water is greater.

It farther appears, that chilled cast iron corrodes faster than the same sort of cast iron cast in green sand, and that the size, scantling, and perhaps form of a casting, are elements in the rate of its corrosion in water. The explanation of these facts is to be found in the want of homogeneity of substance, and the consequent formation of numerous voltaic couples, by whose action the corrosion is promoted. It is also observable that the corroded surface of all these chilled specimens is tubular.

It appears also, that in castings of equal weight, those of massive scantling have proportionately greater durability than those of attenuated ribs and feathers—hence appears also the great advantage of having all castings (particularly those intended to be submerged) cooled in the sand, so as to insure the greatest possible uniformity of texture. The principles now stated afford an explanation of the fact often observed, that the back ribs of cast iron sheet piling decay much faster than the faces of the piles. It is also probable that castings in dry sand and loam will, for these reasons, be more durable than those cast in green sand. The general result of all these experiments gives a preference to the Welsh cast iron for aquatic purposes, and to those which possess closeness of grain. Generally, the more homogeneous, the denser and closer grained, and the less graphytic, the smaller is the index of corrosion for any given specimen or make of cast iron.

Mining Jour.

New method of Analysing Sulphurous Waters.—Iodine as a test for Hydro-Sulphuric Acid.—Sulpho-Hydrometer. *By* M. ALPHONSO DUPASQUIER.

Being occupied in making a complete history of the fine establishment which has lately been founded near the sources of Allevard (Isere,) M. Dupasquier has devoted himself, with peculiar care, to the analysis of the sulphurous water which they so abundantly yield. He has studied it very accurately, and his investigations have led to the discovery of a process, as simple as delicate, for detecting and ascertaining the proportion of hydro-sulphuric acid, free or combined, contained in mineral waters.

Tincture of iodine, poured into a liquor impregnated with hydro-sulphuric acid, completely decomposes that acid, and so instantaneously, that it is very easy to ascertain the point at which its decomposition is finished, and when the iodine no longer enters into combination. Setting out from this observation, which is his own, it occurred to M. Dupasquier that, by using a carefully prepared tincture of iodine, he might be able, from the quantity of iodine required for saturating a quart of sulphurous water, to deduce the proportion of free or combined hydo-sulphuric acid which it contained.

This opinion has been confirmed by experiment, and M. D. has rendered his new method of analysis extremely convenient, by means of an instrument which he calls a sulpho-hydrometer. This instrument is a graduated tube, filled with tincture of iodine, one extremity of which is closed by a cork, whilst the other is tapered, and terminates in a capilliary aperture, which allows the tincture of iodine to run out, drop by drop, when the cork is removed.

To use the sulpho-hydrometer, a given quantity of sulphurous water is poured into a porcelain capsule; a few drops of a very clear solution of starch are then added; then the tincture of iodine is gradually dropped into it, taking care to assist the action by stirring. So long as any traces of hydro-sulphuric acid remain, the iodine deprives it of hydrogen, precipitating its sulphur, and immediately disappears, without colouring the starch; but from the time that the saturation is complete, the least trace of free iodine is sufficient to communicate to the liquor a fine blue colour. The number of degrees that the tincture of iodine is lowered in the sulpho-hydrometer, must then be reckoned; each degree represents one centigramme of iodine, and each tenth of a degree one milligramme. The quantity of iodine necessary to saturate a quart of sulphurous water being thus given, it is very easy to ascertain how much hydro-sulphuric acid the water contained, by determining the equivalent of the iodine in the hydrogen, the volume of which being known, we have that of the hydro-sulphuric acid.

To render the use of his instrument more easy, M. Dupasquier has prepared a table, indicating in weight and bulk, the quantity of hydro-sulphuric acid, represented by 1, 2, 3, &c., 100 centigrammes, 1, 2, 3, &c., milligrammes of iodine.

This mode of analysis, independent of giving results of the strictest accuracy, has also the advantage of being so expeditious, that fifteen

or twenty experiments may be made in less than an hour. It is also so simple, that it is not necessary to be a chemist to determine the proportion of hydro-sulphuric acid contained in a mineral water; any intelligent person may ascertain the variations in the strength of sulphurous waters, caused by atmospheric influences, or by the mixture of rain water. Among other advantages which this method presents, M. Dupasquier holds up to notice its extreme delicacy, which is so great, that it indicates the precise quantities of hydro-sulphuric acid in waters on which other re-agents would have no action, although they evidently exhibit a sulphurous character. Tincture of iodine may, indeed, he has ascertained, unequivocally detect one drop of a concentrated solution of an alkaline hydro-sulphate, diluted in a hectolitre of water, whilst known re-agents become powerless when it is diluted in ten quarts.—*Annales de Chimie et de Physique.* Mining Rev.

Patent Wire Rope.

It has been our desire to enter more fully into the merits of this patent than we had space on the former occasion, when directing attention to its applicability, both with regard to economy and security for our mines, but we have not yet been in a situation to afford a notice so satisfactorily as we could wish, the information we contemplate receiving not having come to hand. In its absence we have only to note the additional trial made at the Chain Cable Proof House, at Withymoor, near Dudley, on the 25th ult., of which the following is a copy of the certificate signed by Mr. Lewis, the proprietor of the machine:—

Description.	Size.	Bore without Breaking.	Broke at	Second Breaking.	Third Breaking.	Weight per Fathom.
	Inches.	Tons.	Tons.	Tons.	Tons.	lbs. oz.
Flat	4 by ½	11	11½	6	3	7 6
"	3½ by ⅜	7	7½	4	1	4 15
"	3 by 3-16	2	2½	2	..	2 5
Round	3-inch.	16½	17	8	3	7 0
"	2½-inch.	12	13	5	2	5 13
"	1¾-inch.	6½	7	4	1	2 13

From this it will be seen that, in addition to the strength of tension employed previous to breaking, instead, as in the case of cable or hempen rope, of its breaking short, it required three separate strains to break it entirely. We have been favoured with a letter from a friend in the north who has just received some, and who promises to advise us of the results of trial to which he intends to submit it. Specimens of the various descriptions may be seen at the Polytechnic Institute, Regent street, and at the Adelaide Gallery, as also at our office. The increasing demand for the article, and the test it has borne of some years' trial by the Admiralty, is the best report upon, and evidence of, its superiority. We should think it peculiarly well adapted for the London and Blackwall Railway, where, we understand, the rope has

snapped some half-dozen times. The size of the rope used there is, we believe, 6¼ in., and the cost of a single rope 1250*l.* Mining Jour.

New Process for Making Sulphuric Acid.

M. Provostaye, of Paris, has proposed the following process:—He recommends introducing into the leaden chamber sulphuric acid, nitric acid, and the vapour of water. To understand what takes place under these circumstances, a current of sulphurous acid may be passed into a flask containing nitric acid; this should be made, by means of a bent tube, to communicate successively with a flask containing sulphuric acid, a globular vessel moistened with water, and a dry globe. The nitric acid is completely decomposed. The first flask contains pure sulphuric acid alone. Red vapours pass from the first vessel into the second: this is filled with sulphurous acid also, for it is formed of solid white crystals, in the two last experiments, as in the first. In the latter, all the sulphuric acid of the second flask exists in a solid crystallized mass, of a greenish yellow colour. The re-actions are, therefore, similar to those of the old process. In the new process, the nitric acid yields a portion of its oxgen to the sulphurous acid, in order to convert it into sulphuric acid. Hyponitric acid is thus formed, which acts like the hyponitric acid in the old process, which is formed from the binoxide of azote and oxygen of the atmosphere—that is to say, successively it yields oxygen to the sulphurous acid, and borrows it from the air: but the discharge requires the intervention of sulphuric acid and water. The water has two very distinct functions, it acts directly, by bringing into more intimate contact the sulphurous acid and hyponitric acid, and this favours the oxidation of the first by the oxygen of the second; it acts also by decomposing the white crystals immediately, and changing them into sulphuric acid and oxide of azote. Ibid.

Cornish Engines.

A deputation from the Dutch government having visited Cornwall in order to ascertain, by actual inspection, whether the duty performed by the steam engines employed in the mines is equal to what is stated in the monthly reports, the adventurers and agents of the undermentioned mines kindly permitted an experiment of six hours to be made on their several machines, and the duty as stated below was the result:—Wheal Vor, Borlase's engine, 80 inches single, 8,0 feet stroke, 123,300,593 lbs. lifted one foot; Fowey Consols, Austen's engine, 80 inches single, 9,0 feet stroke, 122,731,766 lbs. lifted one foot; Wheal Darlington engine, 80 inches single, 8,0 feet stroke, 78,257,765 lbs. lifted one foot; Charlestown United Mines, 50 inches single, 7,5 feet stroke, 55,912,392 lbs. lifted one foot; Charlestown United Mines Stamping engine, 32 inches single, lifting 66 stamps, 60,525,000 lbs. lifted one foot; Wheal Vor Stamping engine, 36 inches double, lifting 72 stamps, 50,085,000 lbs. lifted one foot.—*Lean's Engine Reporter.* Railway Mag.

Progress of Physical Science.

Geological Specimens found on the Great Western Railway.

During the formation of the line, there were numerous difficulties to encounter, in respect of the number of tunnels, there being no less than five, which, of course, presented a wide field for the geologist. The finest specimens of any antediluvian remains were those of an Icthyosaurus, found in a bed of blue lias limestone, presenting the head, teeth, vertebræ, and ribs, in a most perfect state, the length being from twelve to fifteen feet. The bed of stone in which it was found was broken in half, on account of its immense thickness, for the better enabling its removal with safety. It is still in possession of the Great Western Railway Company, at Bath. Various specimens of the cornua ammonia were also found of all sizes, some of very large dimensions, and others much smaller, appearing as having just come from the hands of the gilder, being covered with a mineral incrustation, and generally found in a bed of wet blue marl.

Near the foundation of an old Roman villa (an account of which appeared in our Journal at the time) were discovered the tusks of an elephant, buried about twenty-five feet in a bed of gravel, which, from its appearance, could not have been removed or disturbed for centuries; and whether deposited there at the Flood, or at some later period (most likely during the earlier part of the Roman sway in this country) must remain for more experienced geologists than myself to decide. Near the same spot was discovered an old stone coffin, formed so as to contain three bodies, being built of the oolite or Bath stone, and which, upon being opened, presented to view a small quantity of bones.

It has often afforded me matter for wonder, that amongst the directors and shareholders of some of our leading railways, something has not been done at the different stations for the establishment of a Museum, in which a collection of all specimens found on the different works should be kept open for the benefit of the passengers and the public in general.

Mining Jour.

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*Abstract of the Proceedings of the Physical Section of the British Association, at the Glasgow Meeting.**

CONTINUED.

Propagation of Heat through different Strata.

PROFESSOR FORBES finds from the mean of experiments made in 1837, 8, and 9, upon the propagation of the heat received from the sun's rays through strata, consisting of trap rock, pure loose sand, and sand stone, the following rates of propagation.

* From the Proceedings given in the London Athenæum for October, 1840.

For one foot in depth, the relative rates of conduction are:—in trap, 7.4, in loose sand, 7.0, in sand stone, 4.4.

Cause of the Phenomenon in Vision called "Muscæ Volitantes."

Sir David Brewster has examined this phenomenon with the following results:

1. That in persons of all ages, and with the most perfect eyes, transparent filaments or tubes exist in the vitreous humour, at different distances from the retina. 2. That these filaments float in the vitreous humour, moving about with the motion of the head. 3. That these filaments are seen by means of their shadows on the retina, and are most distinctly visible in divergent light; these shadows being bounded by fringes produced by diffraction or inflexion. 4. That the real muscæ resembling flies, are knots tied, as it were, on these filaments, and arising from sudden jerks or motions of the head, which cause the long floating filaments to overlap and run into knots. 5. By making experiments, the limits of the motions of the muscæ; by measuring their apparent magnitude, and producing double images of them by means of two centres of divergent light, the author was able to determine their exact place in the vitreous humour; and to ascertain the important fact that the vitreous humour in the living human eye is contained in cells of limited magnitude, which prevents any bodies which they contain from passing into any of the adjacent cells. Sir David Brewster concluded with the following observations. "I have dwelt thus long on the subject of the *muscæ volitantes*, not only because it is an entirely new one, but also on account of its practical utility. Mr. Mackenzie informs us 'that few symptoms prove so alarming to persons of a nervous habit, or constitution, as *muscæ volitantes*, and they immediately suppose that they are about to lose their sight by cataract or amaurosis. The details which I have submitted to you prove that the *muscæ volitantes* have no connection with either of these diseases, and are altogether harmless. This valuable result has been deduced from a recondite property of divergent light, which has only been developed in our own day, and which seems to have no bearing whatever of an utilitarian character; and this is but one of numerous proofs which the progress of knowledge is daily accumulating, that the most abstract and apparently transcendental truth in physical science will, sooner or later, add their tribute to supply human wants, and alleviate human sufferings. Nor has science performed one of the least important of her functions, while she enables us, either in our own case or in that of others, to dispel those anxieties and fears which are the necessary offspring of ignorance and error.'"

Report of the Committee on Combined Magnetic Observations.

The Committee reported that the series of simultaneous magnetic observations were now made at between thirty and forty stations,

including the two hourly observations during both night and day, and the monthly term observations, at intervals of two minutes and a half. Observatories have been established at Dublin, by the University, at Greenwich, Toronto, Upper Canada, the Cape of Good Hope, St. Helena, and Van Dieman's Land, besides two itinerant observatories of the Antarctic Expedition, by the British Government, at Madras, Simla, Sincapore, and Aden, by the East India Company, ten stations in European and Asiatic Russia, and one at Pekin, by the Russian Government, one at Prayree, and one at Milan, by the Austrian Government, one at the Girard College, at Philadelphia, one at the University of Cambridge, in New England, one at Algiers, by the French Government, one at Breslaw, by the Prussian, one at Munich, by the Bavarian, one at Cadiz, by the Spanish, one at Brussels, by the Belgian, one at Cairo, by the Egyptian, one at Trevandrum, by the Rajah of Travancore.

Magnetic Observatory at Munich.

Dr. Lamont gave an account of the magnetic observatory of Munich, stating that the building had been commenced in April of this year, and that the regular series of observations, comprehending both the two hourly daily observations, and the term day observations, were commenced on the 1st of August. The magnetic observatory of Munich differs in two respects from other establishments of the same kind. In the first place, it is not a magnetical house, but a subterranean building, which is situated to the S. W. of the royal observatory, at a distance of about 120 feet, and connected with it by a subterranean passage. The depth of the magnetic observatory below the surface of the earth, is 13 feet, thus affording the advantage of a temperature nearly equal, at all times of the year, and rendering the corrections applied to magnetic observations in order to reduce them to a fixed temperature, corrections which are, in general, subject to considerable uncertainty, if not unnecessary, at least sufficiently small to be determined with the utmost degree of accuracy. In the second place, the instruments are of greater dimensions than are usually employed in magnetic observatories, and may be considered as sufficient in all respects for the most delicate investigations. The magnetic bars weigh 25 pounds each, the theodolite has a circle of 2½ feet diameter, and an achromatic telescope of 3½ inches aperture. It may be remarked that the horizontal force instrument differs from the bifilar magnometer, the power that holds the bar in the direction perpendicular to the magnetic meridian, being that of a spiral spring.

Meteorological Observations in Bavaria.

The Royal Observatory at Munich, is the central establishment of the system, which includes observations at no less than two hundred and sixty towns and villages, the observers being either members of a meteorological society, formed for the purpose, or persons employed

by the government. Hourly registry is made at the Munich Observatory, of the temperature and pressure of the air, by self registering instruments.

On the Principles of Electro Magnetic Machines.

Professor JACOBI, of St. Petersburg, infers, from his experiments, the following laws in reference to the magnetism developed by the application of the galvanic current.

1. The amount of magnetism produced in malleable iron by a galvanic current is proportional to the force of the current.

2. The thickness of the wire composing a helix, and surrounding an iron rod, is of no consequence, provided the number of turns of the helix, and the force of the current, remain the same. With thin wires, however, a more powerful galvanic battery must be used, in order to overcome the resistance in the conductors.

3. Generally, in practice, the influence of the coil, may be neglected.

4. The total action of the electro-magnetic helix upon the iron rod, or core, is equal to the sum of the effects produced by each coil separately.

5. The maximum of magnetic effect is obtained from a galvanic current, when the total resistance of the conducting wire, which forms the helix, is equal to the total resistance of the battery.

6. When the diameter of the iron cylinder forming the core of the helix is increased, the length remaining the same, the force of magnetism developed by a given current is increased in the same proportion.

7. A variation in the length of the core only influences the result by admitting a greater number of turns of the helix upon it.

8. The attraction of electro-magnets is proportional to the square of the force of the galvanic current, by which they are formed.

In the last trials made in propelling a boat twenty-eight feet long, seven and a half wide, and drawing two feet and three quarters of water, on the Neva, a velocity of three miles an hour was kept up. The boat carried twelve to fourteen persons. Professor JACOBI remarks that this is the velocity attained by the first steamboat.

In reference to the practical application of electro-magnetic power, Professor JACOBI gives the following rules. 1st. The maximum of mechanical effect is proportional to the square of the number of voltaic elements, multiplied by the square of the electro-motive force, and divided by the resistance of the voltaic circuit. The co-efficient by which these values must be multiplied to give the effect, depends upon the quality of the iron forming the electro-magnets, the form and arrangement of the rods, and the distance between their ends. A battery of platinum and zinc plates produces two or three times the effect of a similar one of copper and zinc. 2nd. The force of the machine varying directly as the square of the number of coils in the helix, and the velocity inversely as the same square, the maximum power is independent of this number. It is also independent of the

dimensions of the electro-magnetic rods. 3rd. The attractive force of the electro magnets, or pressure of the machine is proportional to the square of the force of the current. 4th. The economic effect, or the available power divided by the consumption of zinc, is expressed by the relation between the electro-motive force and the co-efficient spoken of under the first head. 5th. The consumption of zinc while the machine is at rest is double that when producing the maximum effect.

Professor Jacobi concludes his remarks thus:—

"I consider that there will not be much difficulty in determining with sufficient precision the duty of one pound of zinc, by its transformation into the sulphate, in the same manner that in the steam engine, the duty of one bushel of coal serves as a measure to estimate the effect of different combinations. The future use and application of electro-magnetic machines appears to me quite certain, especially as the mere trials and vague ideas which have hitherto prevailed in the construction of these machines, have now at length yielded to the precise and definite laws which are conformable to the general laws which nature is accustomed to observe with strictness whenever the question of effects and their causes arise. In viewing, on the other hand, a chemical effect, the intermediate term scarcely presents itself. In the present case, it is magnetic electricity, the admirable discovery of Faraday, which we should consider as the regulating power, or as it may be styled, the logic of electro-magnetic machines."

Progress of Civil Engineering.

Account of Dircks' Patent Improved Metallic Railway Wheels with Wood-faced Tyre, read by Mr. Henry Dircks, *before the Mechanical Section of the British Association, at Glasgow, Sept.* 19, 1840. *And also before the Polytechnic Society, at Liverpool, Oct.* 8, 1840.

As an introduction to the observations immediately relating to the improved wheel which is the subject of the present communication, a few preliminary observations may serve to make its nature and advantages more generally understood.

Wooden wheels were originally in common use on railways; these were afterwards superseded by the extensive use of cast iron wheels; and both of these descriptions of wheels were much improved by manufacturing them with wrought iron tyres. Modifications of these wheels are still in use on the Liverpool and Manchester Railway, the wooden wheels having the nave of cast iron, and the spokes and rim of wood, the tyre being of wrought iron. On the London and Birmingham Railway, cast iron wheels are extensively used. On the continent of Europe, and in America, cast iron wheels are seemingly employed by preference; and are no doubt quite as safe for traveling, where great speed is not practised.

In England, a decided preference is given to wrought iron wheels,

in which this metal is used throughout, with the exception of the boss being *cast* around the ends of the spokes. The latest improvement on these has been the making of the entire wheel, including the boss, of wrought iron.

The wheels now in general use derive their chief novelty from the construction and placement of the spokes, with a view to obtain elasticity, strength, and durability. One variety which does not come under this denomination, is the plate wheel, supposed on its introduction to possess some peculiar advantage in overcoming a supposed resistance of the atmosphere. Except, however, in relation to variations in size, the present wheels are little more than varieties in pattern. The common diameter of carriage and waggon wheels is three feet, and the largest driving-wheels for locomotives are those employed on the Great Western Railway, being six or seven feet in diameter,—though at one time they were made as large as ten feet.

The action of an iron wheel on an iron rail, though derived from a rolling motion, can only be compared to a series of blows, and the rebound occasioned by iron striking iron is well known to be considerably greater than is produced by striking wood on iron. To this simple fact we may trace the tremulous motion occasioned by iron wheels on an iron railroad; and when, by any trifling accident, as an inequality from the rising of one end of a rail, or sometimes even from small flinty pebbles getting on the rail, the rebound is not more fearful than dangerous. The tremulous motion of the rail just adverted to renders it necessary in most cases to lay the rails on wooden sleepers. As an illustration of what is meant, it may be mentioned that on the Dublin and Kingstown Railway the rails were originally laid on granite sleepers, but the tremor was so great as to loosen the rails, and occasion serious fears from the consequent damage sustained by engines and carriages passing along the line. It was, therefore, ultimately agreed to take up the granite and lay down longitudinal wooden sleepers, a work of considerable labour and expense. In some cases the nature of the soil or sub-soil may allow the use of stone blocks; and where they can be applied with safety, they are preferred, for the reason that a road laid on *stone* blocks can be kept up at a lower rate than one laid on *wooden* sleepers; and, as has been endeavoured to be clearly shown, the only reason for laying the stone aside, arises from the tremor imparted to the rail by iron wheels as at present used.

We shall now proceed to a description of the improved metallic wheel with wood-faced tyre, showing its advantages in connexion with the preceding observations. The construction of the wheel may be understood by imagining a spoked wheel with a deep channelled tyre. The wheel may be made either of cast or wrought iron, it having been ascertained that tyre bars can be rolled to the required pattern. In this channelled tyre are inserted blocks of African oak, measuring about four inches by three and a half inches, solidified by filling the pores with unctuous preparations; thereby counteracting the effects of wet by capillary attraction,—to which, by this means, it becomes impervious, and at the same time is not liable to unequal con-

traction and expansion. The blocks of wood are cut to the requisite form to fit very exactly in the external circular channel of the wheel, with the grain placed vertically throughout, forming a complete facing of wood. There are about from twenty-eight to thirty of these blocks round each wheel, where they are retained in their place by one or two bolts passing through each, the two sides of the channel having corresponding holes drilled through them for this purpose: the bolts are then well rivetted. After being so fitted, the wheel is turned in the usual manner. The wheel when finished has all the appearance of a common railway wheel, but with a rather deeper rim, the tyre faced with wood, and the flange of iron. Woods of various qualities may be used, whether hard or soft, requiring different chemical preparations according to their porosity, and in some instances requiring to be compressed.

The several advantages which this wheel possesses, are—

1. That the wood facing will wear a considerable time without requiring any repair.

2. That the wood can be re-faced, by turning it up again in the lathe, as practised with worn iron tyres.

3. That the tyre can be re-faced with wood at little expense, and at a far less loss of time than usual. In the operations of re-facing these wheels, or putting in new wood, the work can be performed without the labour and cost of removing the wheels from the axles, which in the keying and unkeying is known to be very troublesome.*

4. That, in regard to their working, it is the opinion of practical engineers, confirmed by actual experiment, that they will work smoother, easier, and, as some have expressed it, more "sweetly" than iron-tyred wheels; with the advantage of going well in wet weather, even upon inclines,—having sufficient adhesion to the rail, without dropping sand to assist them in this respect, as practised when iron wheels are used.

5. That another and very important result will be, that the rails themselves will suffer less wear by using this kind of wheel, and that the fastenings, sleepers, and blocks will receive considerably less injury, and thereby favour the laying of railroads on stone blocks, wherever they are considered to be most desirable.†

A metallic wheel with a wood-faced tyre, which is the principle of this construction, obviates most, if not all, the difficulties which have been experienced, whether in the use of wooden, cast iron, or even wrought iron wheels. Cast iron wheels may, indeed, now be considered not far short of being equal to wrought iron wheels, for safety and durability, with all the superiority of which the application is susceptible. They are also neither clumsy nor inelegant in form, and are capable of being made to any pattern, even for carriage wheels for common roads. It may, therefore, very possibly occur that they

* As in every thing affecting railways, it is a desideratum to decrease the expenses as much as possible, it may here be mentioned that three feet cast iron wheels, with wood-faced tyres and wrought iron axles complete, can be made much cheaper than the generality of wheels.

† On lines situated like the Greenwich Railway and the Blackwall Railway, wood-faced wheels would diminish much of the noise which at pesent is a source of general complaint.

will have the effect to bring cast iron wheels into as general use and as much reputation here as on the continent. This new construction and simple adoption of wood makes excellent driving wheels for locomotives; it may be readily stopped by using a cast iron brake, and does not undergo that wear which might be expected from the friction it then has on the rail. The wood, by use, becomes exceedingly close and firm, acquiring a surface not easily distinguishable from metal in appearance.

Civ. Eng. & Arch. Jour.

On the best method of Ventilating Coal Mines.

When two shafts, or pits, are sunk down to a coal mine, and a road cut through the mine from one to the other, the air that fills this road becomes rarified from the heat of the coal and the minerals surrounding—consequently, ascends one of the shafts, just like a chip of wood when immersed in water, and from the same cause—the shaft that is least in depth being that which the air generally ascends, from an obvious reason. Thus we have a process of ventilation going on, so long as the materials at the bottom remain at a greater degree of heat than the air at the surface of the earth—which current of air is more rapid the colder the air is at the surface (a well known fact amongst miners, that the current of air is greater in winter than summer;) the fire damp, or hydrogen gas, that issues out of the fissures of the coal, or minerals either above or below the coal, gets mixed with the agi tated air, and is carried up the shaft as fast as it evacuates itself, leaving the road between the shafts clear and safe. This is the principle on which ventilation is built. A fire placed at the bottom of one of these shafts would heat the surrounding materials also a considerable way up the shaft, and, as the air passed, part of it would be consumed by the fire; the other, and by far the greatest part, would become rarified by passing the fire and heated materials, and so ascend rapidly up the shaft—at the same time the surrounding air would rush down the other shaft to supply its place. Thus, a fire placed at the bottom of one of the shafts is only a more powerful substitute for the natural process; it is also evident, that the bottom of the shaft is the most proper place to put a fire—and those who doubt this have only to make the experiment to be convinced.

Having thus got a current of fresh air, we have only to direct its course through the various workings to carry away the gases as they evacuate themselves; but before I describe any method for doing this, let me show how the shafts are got down, also how the road is cut between them, which is generally a troublesome piece of work to manage. Shafts may sometimes be sunk to a considerable depth without experiencing any difficulty or danger from the damps or gases, but, when these present themselves, recourse must be had to some method for removing them away. The general way in this part of the country is to partition a small segment of the shaft off by means of boards, or, otherwise, to introduce pipes made of boards, of a foot by sixteen inches aperture, down the shaft, carrying the partition or

pipes along with them as they proceed in sinking, till they reach the mine; this partition, or the uppermost pipe, when pipes are used, is bent at the top, and carried in an horizontal direction to a little distance from the mouth of the shaft, where a chimney is erected, and a fire kindled at the bottom of it, similar to that mentioned by Mr. "X.," which causes a current of air to descend down the shaft and up the partition, or pipes, to the fire, then up the chimney, carrying away the damps or gases, as before described. Now, having a double road down the shaft for the ingress and egress of the air, answering for a time as two shafts, the cutting of the air or wind-road is then commenced. This road is cut double—that is, two roads are cut at the distance of about six feet from each other, and every three or four yards a cross-way is cut through between them—the pillar or coal left between them serving as a partition—the air coming down the shaft up one of these roads, turning through the opening or cross-way between them, then down the other road and up the partition, or pipes, to the fire. In this way the work proceeds till it reaches the other shaft, the miners always building one opening up as soon as they have cut another through. I may here remark, that while they are cutting the three or four yards, also the opening between, they are obliged either to let their candles remain at a distance behind them, or, otherwise, use the Davy lamp—the Davy lamp is generally used on this occasion.

The method of working coal mines are various, depending on the nature of the mines themselves, but more especially on the roof; there are, however, three essential points to be aimed at, the accomplishing of which depends on the skill of the manager. First—he must aim at getting as much of the mine out as possible, at the least expense, without injuring the workmen. Second—at keeping a good road free from wet and dirt, for the conveyance of the coals from all parts of the workings to the shaft. Third—at the greatest safety to the miners, from the roof and other things, but more especially from the damps or gases. He who has accomplished these deserves the name of manager. It may be thus conceived, that as the mines, and especially the roofs, vary, the methods of working and ventilating them must vary also—but all methods that have fallen under my observation bear some analogy to one another. By driving the roads double, as before described, the wagon roads may be cut with safety; but when the open, or wide working, as it is called, is commenced, it is then a little different—but these kind of workings should be so conducted as to have a current of air passing through them. Mining Jour.

Description of the Nonsuch Iron Passage Boat plying on the Limerick navigation, between that place and Killaloe. By Charles Wye Williams.

The attention of Mr. Williams having been attracted to the successful plan for the conveyance of passengers adopted on the Glasgow and Paisley Canal, where light sheet iron boats of great length travel

at a speed of nine miles an hour, he was induced to attempt the introduction of the same system on the Irish canals. A great difficulty, however, presented itself, as the locks there would only admit boats sixty feet long, which length was quite inadequate to the carrying out with advantage the principle involved in the long light Scotch boat. To overcome this difficulty, he constructed a sheet iron boat, eighty feet long, and six feet six inches wide at midships, having stem and stern ends (each ten feet long) attached by strong hinges to the body, and susceptible of being rapidly raised to a vertical position by means of winches; thus reducing the length to sixty feet when required to pass through a lock. It is evident that by this means there would be gained not merely the apparent additional buoyancy of ten feet at each end of the boat, which from the form would not be very effective, but in reality the buoyancy due to an addition of twenty feet of the midship section. The boat thus constructed has been found to answer perfectly; the buoyancy is equal to that of the Scotch boats of similar dimensions; no crankness or unsteadiness accrues when the ends are raised; it is capable of carrying sixty passengers, traveling at a speed of nine miles per hour, with the same power that was required to draw a sixty feet boat with a less load, and there is a much less action on the canal bank in consequence of the increased length, which at the same time imparts stiffness, and enables passengers to enter and leave the boat with safety. Considerable time is saved in passing the locks, by the opposition of the square end when the bow is raised; the boat may thus be run almost at full speed into the lock, and both ends being raised simultaneously, it is stopped much more easily than if the tapered ends were down. No provision is necessary for keeping the ends down, as the weight of the bow and steersman answers the purpose. This boat has been working without intermission for three years between Limerick and Killaloe, traversing twice daily a distance of fifteen miles, on a navigation of considerable intricacy, and passing eleven locks, without any accident having hitherto occurred.

Athenæum.

Mechanics' Register.

Accidents on Railways.

To the list we gave last week of railways, the miles run, and accidents which have occurred, we have to add the returns of the following:—

The Great Western has run 29,200,000 miles, carried 1,520,000 passengers, without any accident, fatal or otherwise, to a passenger, from its opening, 2 years and three months.

The Brandling Junction has run 92,876 miles, and carried 617,000 passengers without any fatal, and only two trifling accidents, neither of which prevented the parties from going about their usual business, in 12 months, to the 5th instant.

The Bolton and Leigh has run 223,480 miles; carried 674,870 passengers in 9¼ years, to the 15th September, with the following acci-

dents:—one passenger, attempting to get into the train when it was starting, got his foot bruised; another, who had got upon a wagon going off with the train, was thrown off and had his arm injured; a third had a slight contusion occasioned by a collision; and a fourth was killed by jumping off a train going at full speed, in consequence, as it was believed, of his being intoxicated. The only accidents attributable to the Railway are obviously the "slight contusion," and the injured arm.

The Dundee and Arbroath, opened October the 8th, 1838, (now 23 months) has, to the 1st September inst., carried 378,043 passengers, (the miles run not stated) with the following solitary accident, namely, the breaking of the leg of a passenger who had, contrary to the regulations, got into the luggage wagon.

The Arbroath and Forfar was opened January the 3rd, 1839, (now 20 months) and has run 59,000 miles, and carried 175,000 passengers, to September 10th. One accident only has happened; that is, a passenger broke his leg by jumping off the train while in motion.

Thus are added to our former list, from these five railways, only one of which is a large passenger line, 3,365,000 passengers carried, and on four only of the lines 29,575,000 miles run, without one fatal accident, and only two slight bruises fairly attributable to the Railways; for we repudiate all accidents which the drunken or headstrong ways of men, violating orders and rules, bring upon themselves. The account, therefore, will stand thus; about 256 millions of miles have been run, and 14 millions of persons carried, with only two fatal accidents from the railway system. Railway Mag.

Comparative Longevity of Miners.

The average age of those miners who died in Illogan, was forty-nine, and of those not miners, sixty-eight—making a difference of nineteen years. In Gamborne, the longevity of the miner was fifty-four years, whilst that of the man not employed in mines, was sixty—showing only a difference of six years. On this he should have to remark presently. The average of Gwennap was, of the miner, forty-six years, and of the non-miner sixty years—exhibiting a difference of fourteen years. But there was one other important fact, and to that he begged to direct the attention of the philanthropist. A mean per centage of seventeen of their mining population came to violent deaths in consequence of their employment. In Gwennap the deaths were one-sixth, but in Illogan he found it increase to 32 per cent.—so that it appeared that of the miners buried in Illogan, one-third had been the subjects of coroners' inquests. Mining Jour.

Early Settlement of America by Europeans.

A highly interesting discovery has been announced by the Danish geologist, Dr. Lund, to the Northern Archaiological Society, as made by him, while excavating in the neighbourhood of Bahia, in Brazil. This discovery began with the fragment of a flag stone, covered with

engraved Runic characters, but greatly injured. Having succeeded in decyphering several words, which he recognized as belonging to the Icelandish tongue, he extended his researches, and soon came upon the foundations of houses in hewn stone, bearing a strong architectural resemblance to the ruins existing in the northern parts of Norway, in Iceland, and in Greenland. Thus encouraged, he went resolutely on, and at length, after several days' digging, found the Scandinavian God of Thunder, Thor, with all his attributes—the hammer, gauntlets, and magic girdle. The Society has commissioned Professor Rafn, who first established, in an authentic manner, the existence of ancient relations between Iceland and Northern America, (anterior to the discovery of that part of the world by Columbus) to report on the subject of Dr. Lund's letter, and to publish his report, with a view to direct the attention of the learned to this very interesting discovery, which would seem to prove, that the ancients of the North had not only extended their marine voyages to Southern America, but even formed permanent establishment in that country.

Athenæum.

Improved Mode of Applying Water-power, patented by Captain George Davey.

The inventor claims the application of air jackets or chambers to a column of water, and the method of applying the power obtained by the pressure of the said column of water, through the medium of the compressed air contained in the said air jacket, whereby so great a quantity of air is driven into the working cylinder as to effect a great saving of water, which, in cases requiring a reservoir at a high level, is very important. An upright tube leads from the reservoir to the full extent of the fall of water; at each thirty feet this tube is surrounded by an air jacket, and three or four fine holes are made at the bottom of the tube, within the space covered by it. The lower part of the tube has a lateral connection with a small cylinder, with a double piston or dead boxes working therein. At the opposite side of this cylinder, there is a lateral connection with the working cylinder, that moves, by its piston and rod, the pump or engine. The water, passing from the reservoir, down the tube, forces a quantity of air from the air jackets, with the water, through the small cylinder (that has its double piston open) into the large working cylinder, by which means the piston of this cylinder is forced up; and the tappets on the rod of this piston are so arranged as to strike a lever connected with the rod of the double piston, which admits and shuts off the supply of water from the tube to the working cylinder. The piston of this cylinder being now forced up, the tappet on the rod causes the lever to put the double piston in such a position as to cut off the supply of water, until the water that is below the large working cylinder flows out into the waste, or discharging level. The piston with the rod, in descending, by its gravity, causes another tappet to strike the lever, and put the double piston or dead boxes, in the first position, in order to receive a fresh supply of compressed air and water, to set

the piston in the large cylinder again in motion, which communicates its power to a pump or engine. Civ. Eng. & Arch. Jour.

An Improved Apparatus for Regulating the Supply of Water to Steam-boilers, patented by* JAMES KNOWLES, *Little Bolton, Lancaster.

Claims the use of a self-acting apparatus, the working parts of which are within the boiler, and communicate to the supply valve from without. A lever or rod is placed longitudinally on a fulcrum within the boiler, the longer end of which is an upright rod, with a float attached thereon, passing to the outside of the boiler; at the shorter end of the lever is another upright rod connected with the supply valve, working in a tube. As long as there is plenty of water in the boiler, the float will continue to press up the long end of the lever, and, consequently, cause the valve on the upright rod of the short end of the lever to press down on its bearing, and prevent the admission of water from the tank. But when the height of the water in the boiler diminishes, the float lowers with it, and thereby forces up the rod with the valve; thus admitting a further supply of water until the float again rises to close down the valve.—*Inventor's Advocate.*

Ibid.

Meteorological Observations for December, 1840.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inch's	Inch's			Inches.	
	1	23	34	29.65	30.10	W.	Moderate.		Cloudy—clear.
☾	2	22	38	30.25	.25	S.E.S.W	do.		Clear—do —do.
	3	29	44	.15	.15	W.	do.		Partially—do.—do.—do.
	4	27	28	.32	.35	N.E.	do.		Cloudy—do.
	5	20	25	.16	.12	W.E.	do.	.63	Snow—cloudy,
	6	20	26	29.91	29.86	N.N.E.	Brisk.	1.05	Snow—do.
	7	19	29	30.07	30.12	N.W.W.	Calm.		Clear—do.
☉	8	16	32	.13	00	S.W.	do.		Clear—cloudy.
	9	28	34	29.95	29.88	S.W.	do.		Clear—partially cloudy.
	10	33	46	.78	.75	W.N.W.	do.		Cloudy—clear.
	11	29	40	30.04	30.06	W.	do.		Clear—do.
	12	25	42	.10	.00	E.	do.	.78	Clear—rain.
	13	40	45	29.50	29.50	W.	Moderate.		Cloudy—clear.
	14	32	43	.60	.60	W.	do.		Clear—do.
	15	29	46	.60	.60	W.	do.		Hazy—do.
☽	16	38	34	.36	.56	W.N.	do.	.45	Lightly cloudy—snow.
	17	26	32	.60	.65	W.	do.		Clear—flying clouds.
	18	22	24	.80	.83	W.	Brisk.		Partially cloudy—do.—do.
	19	10	28	.95	30.00	W.	Moderate.		Clear—do.
	20	15	28	30.04	.10	W.	do.	.30	Clear—shower.
	21	21	30	.00	.02	W.	Brisk.		Clear—do.
	22	30	38	29.75	29.58	W.	do.		Cloudy—do.
⊗	23	20	28	30.01	30.00	W.	Moderate.		Clear—do.
	24	29	35	29.74	29.74	W.	do.		Cloudy—partially cloudy.
	25	12	22	.96	.96	W.	do.		Clear—do.
	26	24	38	.60	.50	E.	Calm.	.35	Snow—cloudy.
	27	28	24	.46	.46	W.	Moderate.		Cloudy—do.
	28	19	29	.85	.95	W.	do.		Clear—do.
	29	24	36	30.00	30.00	W.S.W.	do.		Cloudy—lightly do.
	30	31	38	.00	00	W.	do.		Cloudy—do.
☾	31	33	41	29.94	29.94	E.W.	do.		Cloudy—lightly do.
	Mean	25.35	34.06	29.87	29.89			3.58	

	Thermometer.	Barometer.
Maximum height during the month.	46.60 on 10th and 15th.	30.35 on the 4th.
Minimum " "	12.00 on the 25th.	29.46 " 24th.
Mean	29.705	29.88

METEOROLOGICAL REPORT

FOR THE STATE OF PENNSYLVANIA,

Collated from returns made to the Committee on Meteorology of the Franklin Institute of the State of Pennsylvania, for

FEBRUARY, 1841.

	County.	Town.	Observer.	Thermometer. 7, A.M.	2, P.M.	9, P.M.	Maximum.	Minimum.	Mean.	Days omitted.	Register. Lowest.	Mean.	Days omitted.	Barometer. 7, A.M.	2, P.M.	9, P.M.	Maximum.
1	Philadelphia,	Philadelphia,	G. P. Schively,	30.93	36.75	30.68	52.50	4.50	32.79	.	3.00	27.93	.	29.98	29.98	29.97	30.33
2	Montgomery,																
3	Bucks,	Newtown,	L. H. Parsons,	24.10	35.13	26.84	49.00	2.00	28.69	.	1.75	21.40	.	29.95	29.94	29.96	30.35
4	Lehigh,																
5	Northampton,	Easton,	Charles Elliot,														
6	Monroe	Stroudsburg,	A. M. Stokes,	15.04	32.83	17.50	44.00	—11.00	18.46	13½	....	....	.	29.39	29.44	29.48	29.70
7	Pike,	Milford,	Ralph Bull,														
8	Wayne,	Hone-dale,	W. Richardson,	14.36	29.43	16.54	46.00	—8.00	20.22	.	—20.00	8.86	.	28.66	28.65	28.66	29.00
9	Susquehanna,	Silver Lake,	E. Rose,	19.89	28.07	24.04	50.00	—2.00	24.33	.	....	....	.	27.99	27.98	27.98	28.36
10	Luzerne,	Wilkesbarre,	W. F. Dennis,														
11	Schuylkill,	Port Carbon	P. C. Lyceum,	17.79	38.57	21.80	52.00	—13.00	26.05	.	—15.00	12.25	.	29.19	29.19	29.15	29.86
12	Berks,	Reading,	C. F. Egelmann,	21.94	32.75	25.07	46.00	00.00	26.59	.	—4.00	17.80	.	29.70	29.68	29.71	30.1
13	Chester,	West Chester,	Wm. W. Jefferies,	....	....	....	....	....	....	.	00.00	22.97	.	29.80	29.80	29.80	30.07
14	Delaware,	Haverford,	Haverford School,	29.86	36.73	32.64	49.00	14.00	33.08	6	00.00	20.57	.	29.43	29.38	29.41	29.76
15	Lancaster,	Lancaster,	Conservatory of Arts,	24.68	36.39	27.16	54.00	3.00	29.41	.	2.00	22.43	.	29.32	29.29	29.32	29.73
16	York,																
17	Lebanon,																
18	Dauphin,	Harrisburg,	J. Heiseley,	25.04	31.44	29.63	44.00	5.00	28.70	⅓	5.00	22.14	.	29.69	29.65	29.70	30.07
19	Northumberland,	Northumberland,	Andrew C. Huston,	19.00	34.39	24.18	52.00	—9.00	25.86	.	—13.00	13.68	.	29.30	29.26	29.30	29.65
20	Columbia,	Danville,	C. H. Frick.														
21	Bradford,																
22	Tioga,																
23	Lycoming,																
24	Union,																
25	Mifflin,																
26	Juniata,	Mifflintown,	J. A. Kinkead,	18.79	35.88	22.80	50.00	00.00	25.82	1⅓	....	....	.	29.34	29.36	29.34	29.76
27	Perry,																
28	Cumberland,	Carlisle,	Prof. W. H. Allen,														
29	Adams,	Gettysburg,	Prof. M. Jacobs,	21.93	35.07	56.69	50.00	—4.50	27.56	.	—4.50	19.16	.	29.33	29.34	29.33	29.56
30	Franklin,																
31	Huntingdon,	Huntingdon,	Prof. Jacob Miller,	19.88	36.00	24.71	49.00	—13.00	26.86	.	....	....	.	29.18	29.16	29.18	29.56
32	Centre,	Bellefonte,	John Harris,														
33	Potter,																
34	M'Kean,	Smithport,	M. R. Atkins,	17.63	27.19	20.82	40.00	—10.00	21.88	⅓	....	....	.	....	....	....	....
35	Clearfield,																
36	Cambria,	Ebensburgh,	Richard Lewis,	18.21	28.59	21.29	43.00	—7.00	22.70	⅓	...	...	.	27.62	27.63	27.63	28.0
37	Bedford,	Bedford,	Samuel Brown,	22.38	35.83	26.61	49.00	00.00	28.27	.	....	....	.	29.05	29.04	29.06	29.00
38	Somerset,	Somerset,	George Mowry,	22.94	31.54	25.76	45.00	2.00	26.75	3⅓	1.00	18.16	3	27.67	27.68	27.69	28.01
39	Indiana,	Indiana,	Richard White,	26.31	32.88	24.04	47.00	—8.00	27.74	2	....	....	.	28.40	28.45	28.42	28.80
40	Jefferson,	Rose Cottage,	C. C. Gaskell,														
41	Warren,	Warren,	J. E. King,	27.79	35.89	22.47	59.00	1.00	28.72	.	....	....	.	28.52	28.61	28.54	28.97
42	Venango,	Franklin,	Wm. Connely,	16.00	33.32	23.25	47.00	—4.00	24.19	.	....	....	.	28.78	28.79	28.81	29.20
43	Armstrong,																
44	Westmoreland,																
45	Fayette,	Uniontown,	J. P. Weethee,	25.93	34.86	27.86	49.00	4.00	29.55	.	....	....	.	28.90	28.91	28.88	29.24
46	Green,																
47	Washington,	Cannonsburg,	Prof. A. H. Campbell,														
48	Alleghany,	Pittsburgh,	J. P. Bakewell,	26.35	34.20	29.54	52.00	6.00	26.70	6⅔	....	....	.	29.10	29.07	29.11	29.50
49	Beaver,	Beaver,	James Allison,	23.63	33.44	26.31	50.00	5.00	27.79	2	....	....	.	29.20	29.21	29.24	29.00
50	Butler,	Butler,	Jacob Mechling,	25.79	33.21	30.85	47.00	4.00	29.95	.	....	....	.	28.62	28.63	28.63	28.90
51	Mercer,	West Greenfield,	S. Campbell,														
52	Crawford,	Meadville,	J. Limber,														
53	Erie,	Erie,	Park & Reid,														

gister.		Barometer.							Weather.																				
Mean.	Days omitted.	7, A. M.	2, P. M.	9, P. M.	Maximum.	Minimum	Mean.	Days omitted.	Clear.	Cloudy.	Days omitted.	Rain.	Snow.	Rain and Snow.	Thunder Showers.	Rain in inches.	North.	N. N. E.	N. E.	E. N. E.	East.	E. S. E.	S. E.	S. S. E.					
27.93	.	29.98	29.98	29.97	30.33	29.45	29.98	.	15⅓	12⅔	.	....	....	....	..	.....	1	2	3⅓	⅒	.	.	⅒	.					
21.40	.	29.95	29.94	29.96	30.35	29.43	29.95	.	10⅓	16⅔	1	2	2	....	..	1.308	1⅓	⅔	4⅓	.	.	.	.	⅓					
....	.	29.39	29.44	29.48	29.70	29.10	29.42	8⅔	5	11	12	....	....	. ..	..	.....	1⅓	.	1⅔	.	1	.	.	.					
8.86	.	28.66	28.65	28.66	29.00	28.25	28.66	.	19⅓	8⅔	.	....	....	....	..	.....	5⅔	.	4⅔	.	1⅓	.	1	.					
....	.	27.99	27.98	27.98	28.36	27.52	27.98	.	7⅓	20⅔	.	1	6	....	..	0.887	4	.	.	.	.	.	.	.					
12.25	.	29.19	29.19	29.15	29.86	28.21	29.18	.	13	15	.	....	3	....	..	1.042	⅓	.	1	.	1⅓	.	1	.					
17.80	.	29.70	29.68	29.71	30.1.	29.20	29.70	.	12⅓	15⅔	.	....	2	1	..	0.525	.	.	1	.	1⅔	.	.	⅒					
22.97	.	29.80	29.80	29.80	30.07	29.44	29.80	.	15	15	.	....	....	....	..	.....	4⅓	⅒	2	.	1⅔	.	.	.					
20.57	.	29.43	29.38	29.41	29.76	28.92	29.41	.	1⅓	17⅔	.	5	....	....	..	1.545	⅓	2⅒	2	.	⅒	.	.	.					
22.43	.	29.32	29.29	29.32	29.73	28.79	29.31	.	15	15	.	1	5	1	1	1.15.	1⅔	1	3	⅔	⅒	.	1	.					
22.14	.	29.69	29.65	29.70	30.07	29.22	29.68	⅔	.	.	.	....	3	....	..	.. ...	.	.	⅔	.	1⅓	.	7	.					
15.68	.	29.30	29.26	29.30	29.65	28.75	29.29	.	8⅔	19⅓	.	1	6	1	..	1.267	1⅔	.	5⅓	.	3	.	2	⅒					
....	.	29.34	29.36	29.34	29.76	28.82	29.35	1⅓	8⅓	18	1⅔	....	....	....	..	.....	1	.	1⅔	.	⅔	.	⅔	.					
9.16	.	29.33	29.34	29.33	29.56	28.78	29.33	1⅓	13	13⅓	1⅓	....	4	2	1	1.453	1	⅔	2⅔	⅓	.	⅒	1⅓	.					
....	.	29.18	29.16	29.18	29.56	28.68	29.17	.	16	12	.	....	2	....	..	0.917	.	.	.	.	7⅓	.	.	.					
....	.	....	....	....	....	....	....	.	11	16⅓	⅔	....	10	....	..	0.958	3⅔	.	2⅓	.	⅔	.	1⅓	.					
...	.	27.62	27.63	27.63	28.0.	27.23	27.63	⅓	7	19⅓	1⅔	....	....	....	..	.....	⅔	.	⅓	.	⅓	.	1⅓	.					
...	.	29.05	29.04	29.06	29.60	28.60	29.05	.	9⅓	1⅔	.	....	....	....	..	.....	.	.	.	.	.	.	3⅓	.					
3.16	3	27.67	27.68	27.69	28.01	27.30	27.68	3⅓	8	16⅓	3⅓	1	3	....	..	1.000	.	.	⅓	.	.	.	⅔	.					
...	.	28.40	28.45	28.42	28.80	28.40	28.42	2	11	15	2	1	10	....	..	0.664	2	.	.	.	.	.	2	.					
...	.	28.52	28.61	28.54	28.97	28.10	28.56	.	4⅓	23⅔	.	....	....	....	..	.....	.	.	.	.	.	.	⅒	⅒					
...	.	28.78	28.79	28.81	29.20	28.60	28.79	1⅓	7	19⅓	1⅓	....	3	....	..	0.500	.	.	.	.	.	.	6⅓	.					
...	.	28.90	28.91	28.88	29.24	28.34	28.90	.	13	15	.	3	4	....	1	1.312	.	.	1⅓	.	.	.	⅒	.					
...	.	29.10	29.07	29.11	29.50	28.55	29.09	.	11	15⅓	1⅔	....	1	2	..	1.119	⅓	.	.	.	.	⅒	2⅔	.					
...	.	29.20	29.21	29.24	29.00	28.60	29.22	2	8⅓	17⅔	2	2	2	....	..	2.465	⅒	.	.	.	⅒	.	1	.					
...	.	28.62	28.63	28.63	28.90	28.20	28.63	.	13	15	.	....	6	....	..	0.833	.	.	⅒	.	5⅓	.	⅒	.					

Winds.													Hygrometer.					
E. S. E.	S. E.	S. S. E.	South.	S. S. W.	S. W.	W. S. W.	West.	W. N. W.	N. W.	N. N. W.	Calm.	Days omitted.	Dew-point.	Days omitted.	Diff. therm. and dew-point.	Wet Bulb.	Days omitted.	No. of Report.
.	⅔	.	⅓	.	5⅔	1⅔	⅓	4½	5⅔	2½	.	.	....	.		....	.	1384
.	.	½	½	.	4½	⅔	3⅔	1	8⅔	½	½	2	....	.	.....	....	.	1497
.	.	.	.	.	4	.	6⅔	.	2⅓	.	.	10⅔	....	.	.....	....	.	1391
.	1	.	⅔	.	.	.	1⅔	.	12⅔	.	½	.	....	.	.....	....	.	1393
.	.	.	3	.	4	.	9½	.	7⅔	.	.	.	....	.	.....	....	.	1404
.	1	.	.	.	1⅔	.	7	.	5½	.	8⅔	1⅔	....	.	.....	....	.	1394
.	½	.	.	.	1½	.	6½	.	16½	.	⅔	.	....	.	.....	....	.	1382
.	.	.	1⅓	⅓	1⅔	½	1	2⅓	9	1⅔	1	⅔	....	.	.....	....	.	1385
.	.	.	.	.	3⅔	⅔	½	2	10⅔	3⅔	⅔	1⅓	14.89	1	.....	....	.	1399
.	1	.	1	1⅓	4⅔	1⅔	4⅓	1⅔	3⅔	2	.	.	22.71	.	.....	32.14	.	1414
.	7	.	.	.	.	.	.	.	18½	.	.	⅔	....	.	.....	....	.	1383
.	2	⅓	2	.	1	.	7⅓	⅓	3	.	2	.	....	.	.....	....	.	1386
.	⅔	.	.	.	1⅔	.	1⅔	.	7⅔	.	12	1	....	.	....	....	.	1387
⅓	1⅔	.	.	⅔	2⅓	⅓	6½	1⅔	2	.	6	2	17.99	3	.....	30.30	3	1437
.	.	.	.	.	.	.	20⅔	.	.	.	.	.	....	.	....	....	.	1398
													....	.	.....	....	.	
.	1⅓	.	⅔	.	7⅔	.	6	.	4⅔	.	.	1	....	.	.....	....	.	1402
.	1⅓	.	.	.	6⅓	.	7	.	7⅔	.	4	½	....	.	.....	...	.	1390
.	3½	.	.	½	4⅓	8½	⅔	4⅔	6⅓	.	.	.	....	.	.. .	....	.	1388
.	⅔	.	⅔	.	1⅓	2⅔	8	2	⅔	.	8	3½	....	.	....	....	.	1392
.	2	.	.	.	6⅓	.	10	.	5	.	⅔	2	....	.	...	....	.	1401
.	⅔	.	3	.	8	.	6	.	6	.	4⅓	.	....	.	.....	....	.	1397
.	6⅓	.	.	.	⅓	.	.	.	20	.	.	1⅓	....	.	....	....	.	1396
.	⅓	.	.	.	10⅔	.	7	.	8	.	⅔	.	....	.	.....	....	.	1443
⅔	2⅔	.	1⅔	1	⅔	⅓	3⅔	.	8	.	7⅔	1⅔	....	.	.....	....	.	1400
.	1	.	⅓	.	4	.	.	.	17⅓	.	2⅔	2	....	.	.....	....	.	1438
.	⅔	.	⅓	.	16	.	3	.	2	.	.	.	....	.	.....	....	.	1389